THE BOOK OF KNOWLEDGE

ANGEL WITH THE LUTE

This is one of three children that Carpaccio, a great Italian artist, painted at the bottom of a splendid altar-piece, in 1510, for the church of S. Giobbe, in Venice. Carpaccio had painted many other beautiful portraits, as well as legendary and sacred scenes, but in this little lad he seems to have reached the highest expression of his art. There is a pretty story that he found his model in the shadow of one of the old churches, listening to some street musician, and his look of longing led the artist to promise him a lute of his own if he would come to his rooms and sit quite still while he painted him. We like to think that the perfect happiness on his face is caused by the fact that the lute was already his, and we hope that he some day became a great musician as well.

The Book of Knowledge

The Children's Encyclopædia

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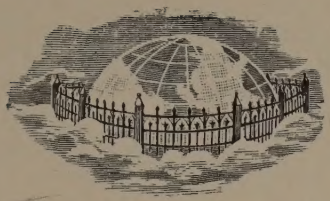

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This is a short guide only to the principal contents of this volume. It is not possible to give the titles of all the Poems and Rhymes, Legends, Problems, colour pages, questions in the Wonder Book, and many other things that come into the volume; but in all cases are given the pages where these parts of our book begin. The full list of these things comes into the big index to the whole work.

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THE DREAMER IN THE DIM LIGHT OF THE WORLD

This is the picture of an inventor thinking out problems long ago. All through the ages there have been dreamers who have looked forward into time and sought to make the world better for those to come; and it is such men who have made it possible for us to have as much light as we like, so that the poorest in these days has in his cottage a treasure which princes could not enjoy in their palaces long ago.

THE DUKE OF WELLINGTON WRITING BY CANDLE-LIGHT

In this picture we see the Duke of Wellington writing his despatches from the wars in the dim light of a candle. He was one of the most famous men in the world, yet when night came he could command no better light than this. For hundreds of years, for thousands of years, kings' palaces were lit up with candles or oil-lamps.

WHAT THIS STORY TELLS US

NOW that men have conquered darkness so that we can fill a place with light by turning a tap, it is hard to imagine what it must have been like to live before men found out how to make light. To-day a child can fill a dark room with light by touching a switch or turning a tap; but even a king could not have done that a hundred years ago. The men who began to light the world with gas were laughed at as if they were idle dreamers, and even wise men declared that lighting houses and towns by gas was a mad idea. But the men plodded on, as all the inventors did, fighting against ignorance and superstition, and they won the day. It is one of the most hopeful signs in the world when the world laughs at you, and we can never pay the debt we owe to the men who struggled hard to benefit the world while those who looked on laughed.

THE MEN WHO GAVE US LIGHT

CONTINUED FROM PAGE 616

"IF you please will you give me some fire?"

What would you think if somebody came to the door and said that? It would sound strange indeed to you; but your grandparents must have heard it often. Think of a place in which gas is not used, where there is no electric light, where there are no matches; then you get an idea of what things were like when your grandfather was a little boy. He will remember when the servant had to burn old rag overnight to make tinder for the morning; how, before it was light, she would have to get up and strike a piece of iron on a piece of flint and make sparks fly from it, to set light to the tinder, so that something else could be lighted from it. If the tinder were damp or the flint old, then there was nothing for it but to go next door and borrow some fire.

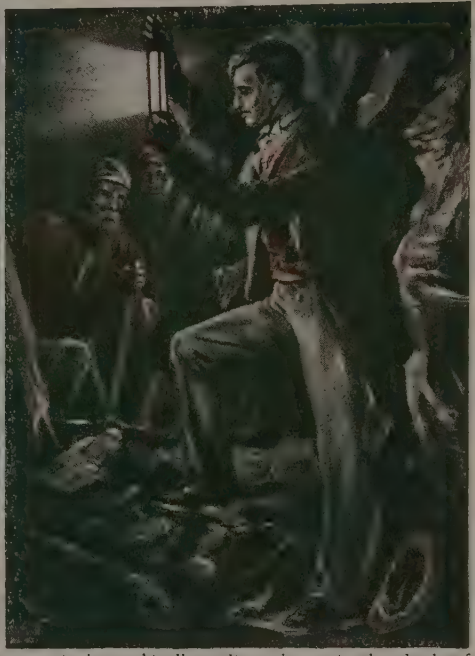
How do you think we first got fire and light? Nobody really knows; but it is supposed that men, ages and ages ago, first found that sticks would burn if dropped into some hole where melted lava from a volcano lay boiling. Or they may have seen trees catch fire through being struck by lightning. Men learned that by rubbing two pieces of wood together they could cause them to catch fire, and for thousands of years that was the way in which they set light to their wood. Savages in many parts of the world still do this; but, as wet wood cannot be made to light in this way, they keep fires always burning where the forests are damp, or, at any rate, during the rainy season. Striking fire from flint came a very long time after the rubbing of wood, for during thousands of years men did not know how to get and use iron.

When they got used to making fires with which to cook their food and to keep themselves warm at nights, they found that certain resins or gums from trees would burn with a bright flame and last longer than wood alone. So they would melt the resin and dip twigs into it, and so make torches, which would serve to light their homes at night. This sort of light had to serve for ages. In fact, the iron stands in which torches used to be fixed are still to be seen on old houses.

We had no gas in American streets, nor, indeed, in any streets in the world, when the nineteenth century came in. Boys ran about the towns at night carrying torches, or links, as they were called, and if you wanted to go to a friend's house after daylight had gone you had to hire a link-boy to light the way.

Napoleon and Washington never saw a gas-lamp. In their day the best lights were candles and miserable

THE BOY WHO FOUND ELECTRIC LIGHT



Electricity has changed the face of the world. It drives our trains and trolleys; it carries water hundreds of miles; it enables us to have light where light could never have been before. The first of these pictures shows us the boy who gave us electric light, Humphry Davy. He was apprenticed to a chemist, and began experimenting with light when he was a boy, though he was one of those who laughed at first at the idea of lighting by gas. He grew up to make the safety-lamp that is used down coal-mines to-day, and he gave us the first electric light.

This great light comes from a wonderful lamp such as is used in many lighthouses to warn sailors of dangerous rocks. When Sir Humphry Davy first began thinking about light, as we see him in the first picture on this page, he had only a candle or an oil-lamp to work by at night; but this lighthouse lamp, shining with the electric light that he discovered, throws a light over the sea equal to the power of 15,000,000 candles.

little oil-lamps, just as men had had for hundreds of years before. When you read about the past splendours and marvels of the palaces of the East, or of the luxury and delight of the great baronial halls of England, you must remember that these places were gloomy and murky at night, with their smoky lamps and dim candles or torches. When you read about the wonderful speeches which Pitt and Burke used to make in the House of Parliament, you must remember that if those speeches were made after dark, the House had to be lighted up with candles. When King William the Fourth was making a speech to the House of Commons, he had to stop, because it was too dark for him to read, and he waited until candles were brought in.

Yet there was gas to be had then as there is now, if men had but known how to get it.

A GREAT BLAZE OF LIGHT THAT SET A CLEVER MAN THINKING

In a coal-mine at Whitehaven, gas used to escape from the coal into the pit. This gas, catching fire, produced a flame a yard wide and two yards long. The gas kept escaping, so the flame continued to burn, and the miners did not know how to put it out. What they did was to build up brickwork round the flame, then put in a metal tube, which they carried to the top of the pit. The gas rushed through this tube and burnt high in the air over the mouth of the mine, and there it burnt for a long time and at night lighted up the country around.

The story of this was printed in 1733, and it set a clever man, called Dr. Clayton, thinking; for in 1737 he began to try experiments with coal-gas. He did not quite know what it was, so he called it "the spirit of coal." He used to burn coal in a retort and catch the gas in bladders. Then to amuse his friends he would prick a hole in the bladder, and, putting the hole near a lighted candle, would startle everybody by letting the gas blaze away until none of it was left. Dr. Clayton had really gone so far towards making coal-gas that he ought to have gone further and made a success of his invention; but he did not know how great a discovery he had made, and nothing serious was done with gas for over fifty years.

One day, in 1777, a young Scotsman walked into the office of Messrs. Boulton and Watt, the steam-engine makers of Soho, Birmingham, and asked for work. He was so nervous when answering Mr. Boulton's questions that he let his hat drop to the ground. The hat made such a noise on touching the floor that Mr. Boulton was surprised, and asked the reason. The young man explained that the hat was a wooden one, which he himself had made on his father's lathe. Mr. Boulton thought that anyone who could do this was no ordinary man, and forthwith engaged him.

THE YOUNG SCOTSMAN WITH A WOODEN HAT, WHO INVENTED GAS-LIGHT

That young man was William Murdock, the inventor of coal-gas. His name really was "Murdoch," but as English people could not pronounce the name in the Scottish way he changed it to Murdock, so that it should be spelt as they pronounced it. He was born in 1754, at Old Cumnock, Ayrshire, and is the same William Murdock of whom you read in the story of the men who made the railways on page 610.

Murdock proved a very clever man. He had a wonderful brain, and was always inventing things, some of which were of much importance. But he was so modest that he never cared for these things for his own sake; he only wished his masters to get the credit for what he did, and his fellow-men to enjoy the benefit. As Murdock was so good a workman, Boulton and Watt sent him into Cornwall, where they built engines. He lived in a cottage at Redruth.

HOW THE GAS-MAN FRIGHTENED THE VILLAGE BY NIGHT

Here it was that he made his model steam locomotive. He had a funny adventure with it. He set it going on the road late one night, without having tried it before, except in his own room. When the little engine got up steam, it raced away from its maker. Murdock had had no idea that it would go so fast. It soon disappeared, and he heard cries of terror in the distance. Murdock ran as fast as he could, and found that the cries came from the lips of the village clergyman, who, seeing the little engine, hissing and aglow with fire, had taken it to be some terrible monster.

Now, the making of gas filled Murdock's mind. Other people knew that it existed, but he was the first man to think out what could be done with it. He made all sorts of trials in secret at his little house, and the boys of Redruth, who knew that this quiet Scotsman was very clever, used to creep softly about outside his house, badly wanting to look in to see what he was doing.

THE BOY WHO BOUGHT A THIMBLE AND SAW IT LIT WITH GAS

One day Murdock came out and saw several of the boys standing there. He called to one, William Symonds, and asked him to run to the shop near by for a thimble. William ran there and back, but he wanted to go into the house to see what that thimble was for. So when he got to the door he pretended to be fumbling for the thimble.

Murdock let him go into the house to find it, and then closed the door behind him. Murdock had got a kettle filled with coal; he had burnt the coal and caused the gas to be driven into a large metal case, such as they used for blasting. In this he had fixed a metal tube. On the end of this he now fastened the thimble, in which he first made one or two small holes. Then he let the gas escape through the tube and thimble, and set light to it. Of course, the gas blazed merrily, and so young William Symonds saw the discoverer of the use of coal-gas make his first trial with gas.

After this, Murdock used to fill bladders with gas, fix a metal tube in the neck, light the gas which came through it, and use it as a lantern to light him about at nights. You will not be surprised to hear that the simple people of Redruth thought he was a wizard.

THE LITTLE COTTAGE IN CORNWALL WHICH WAS FIRST LIGHTED BY GAS

There is some doubt when the first house was lighted by gas. In 1892 a great many people rejoiced because they believed that year to be the hundredth anniversary of gas-lighting; but they seem to have been wrong in their date, for the year was really either 1794 or 1795. In one of those years—it does not matter very much which—Murdock managed to make enough gas to light his house. The gas was made outside the house, in his little garden, then carried by a pipe through a hole made in the window-frame to a position near the ceiling. And there, in that poor Scotsman's little cottage, far away in a Cornish village, gas was first lighted.

When he had succeeded here, Murdock fitted up pipes and made gas and lighted up his master's premises at Soho. That was in 1802, when all the place was lit up to show how glad everybody was that the war between England and France had come to an end.

People did not know what this gas-light was. The retort containing the gas was placed in the fireplace; a pipe ran to the outside of the workshop, and there the gas blazed in two copper vases. That was the first public display of gas-lighting, and people thought it was only some new sort of fireworks.

Murdock's masters were so pleased with the light that in 1803 they had part of their factory at Soho lighted up with gas, and after that other people, seeing how bright it was, how much cleaner and cheaper than lamps and candles, wanted to have their premises lighted in the same way. A Manchester cotton-mill was the next to be lighted with gas, and Murdock fitted up the pipes and burners and had them burning by New Year's Day, 1806.

THE MAN WHO MADE THE GAS-LIGHT AND THE MEN WHO MADE THE MONEY

Up to the time when he lighted up his own house with gas, Murdock was paid $5 a week. When he was called back to Soho, the mine-owners of Cornwall begged him not to go, saying, "We will give you twenty pounds a week to stay." But Murdock was too faithful a servant to heed this. He went to Soho, and in the end he had a salary there similar to that which his admirers in Cornwall had offered him. But he never made any money out of gas-lighting.

Gas-lighting was taken up by a German in London, named Winser. This man wanted Parliament to make everybody in the country burn gas, and to give the company which he was forming the right to make the gas and fit up all the streets and houses with pipes and burners. The profits would be so great, he said, that he would be able to give the State great sums, and make all who lent him money for the beginning of the work very rich indeed. He failed then to get the consent of Parliament, but in 1810

a company was formed which began the lighting of London by gas.

It was not at first successful. People did not believe in gas. Sir Humphry Davy, a very great man, did not believe in it. "To get all the gas you want you will need the dome of St. Paul's Cathedral for a gas-holder, and that will explode," he said. Sir Walter Scott said, "There is a madman in London proposing to light London with—what do you think?—*smoke!*" He did not understand it any better than the most ignorant of men, yet, in later years, he had gas-pipes fitted up at his own house, and found what a splendid thing it was. Winser did good work by persevering till he got the first company formed.

How the Great Gas Mystery Puzzled the People in the Streets

In 1814 Westminster Bridge was lighted up by gas. How the people wondered! They thought that the flame which they saw came through the pipes. They could not understand that the gas came through the pipes, and was lit at the burner; they imagined that there was a roaring flame inside the pipes, and that the lamp-lighters simply turned a tap and let out the flame.

When at last gas was introduced into the House of Commons, people thought the pipes would be so hot that they would burn the building, so they had the pipes fixed far away from the walls, lest the building should be set on fire. Members of Parliament used to put on their gloves to escape being burnt, then go and feel the pipes, to see if they were hot. They could hardly believe their senses when they found that the pipes were cold.

The Great Improvement that has Taken Place in Gas-Light

The first American to light his house by gas was David Mellville of Newport, R. I. Baltimore was lighted in 1817, and Glasgow the same year. Liverpool and Dublin in 1818, and other towns, big and little, soon followed. Murdock made no profit out of it, but the honour of the discovery was his, and he did not mind. He made as much money as he wanted at other work, and was quite well off.

He will always be honoured as one of the best and cleverest of men, and as modest as he was skilful.

Since that time gas-lighting has greatly improved. All sorts of burners have been invented to make the light better. The most important improvement is the incandescent light. This light requires the use of a "mantle," of which many sorts are made. The effect of using one is to cause the mantle to glow and become a brilliant white, so powerful that one such flame will give a light as strong as if the flames from nearly 300 candles were all burning at the same time.

As everybody knows, gas has a strong rival in the electric light. A few years ago, until incandescent gas became general, it seemed as if the electric light would do away with gas. Many men have helped to bring the electric light to its present state of usefulness, and many more will help before it attains perfection. We owe the discovery of it to Sir Humphry Davy.

The Chemist's Apprentice who Made the First Electric Light

Born at Penzance, in 1778, he was only a poor apprentice to a little country chemist when he began his career; but he was so clever, and studied so hard, that he became the most eminent scientist of his day. It was when he had become famous that he began his experiments in electricity.

He had a great electric battery, to which he joined two wires. When their ends touched each other, nothing happened; but when the two ends were drawn just a tiny way apart a light appeared. But it was so hot that it burnt the wires, so Davy fastened two pieces of charcoal on the ends, and thus was able to make a splendid light.

What really happened was this: When the current of electricity was turned on, if the ends of the wires were together, the current ran from one to the other without a break. If the wires were separated, but held near each other, the current rushed to the end of one wire, and, on reaching the charcoal, leapt over with such force to the other piece of charcoal that it carried tiny fragments of the first piece of charcoal with it. These fragments formed a sort of bridge for the electric current from one mass of charcoal to the other. But the air resisted the passage of the

current so much that the bridge of charcoal was made white hot, and so gave this brilliant light. That was the first discovery that electricity would give light, and it was made known by Davy a few years before his death, which took place in 1829.

The great electric arc-lamps which you see in the streets and at railway stations are no more than electricity conducted along a wire to a pencil of carbon, from which it leaps to the end of another piece of carbon, and in its leap causes a great white flame of fearful heat to burn. Of course, the carbon which carries the current soon gets burnt away, while that which receives the current from the first does not.

A LAMP THAT KEEPS OUT THE AIR FOR THE LIGHT TO BURN BRIGHTLY

To make things equal, we now have what are called alternating currents—that is to say, suppose the current is brought by the carbon which reaches from the bottom up to the centre of the lamp, we next change about, and have the current brought in by the stick of carbon which reaches down from the top to the centre of the lamp. In that way they will burn away equally.

The great mischief with this sort of lamp is that, as the flame is exposed to the air, it is made to burn so fiercely. Therefore, until we could get rid of the air in the lamp, it was useless to hope for little lamps for the house. What we needed was a lamp with a vacuum. A vacuum is a space in which there is no air, or so little as hardly to be noticeable, for it is impossible to get a complete vacuum. The first men to find the way to make the small glow-lamp were Joseph Wilson Swan—who was born at Sunderland in 1828—and Thomas Alva Edison, the famous American inventor, who was born in 1847. Mr. Edison was very poor as a boy, and used to sell newspapers, but he has given the world some of its most wonderful inventions.

THOMAS ALVA EDISON AND HIS WONDERFUL LAMP

The difficulty was to get some material in the lamp which would take the place of the sticks of carbon in the arc-lamp. At first a very costly metal, called platinum, was tried. That was all very well while it lasted, but it soon burned away, and it was too costly—nobody could have afforded to buy the lamp. Mr. Edison baked strips of bamboo till they became carbon, while Mr. Swan soaked threads of cotton in acid, and then baked them. Between the two ways a satisfactory method was at last found. Recently lamps have been made with filaments of certain rare metals, such as tungsten, which cost more than the ordinary kind but give a brighter light. The filament which you see carrying the flame in the bulb has to be connected with wires which run through the neck of the lamp, and are connected with the wires which carry the current to the lamp.

Now, heat causes things to expand. When the electric current enters the lamp, it causes the glass rapidly to expand. If the wires running through the neck of the lamp did not swell just as quickly, a space round them would open and let the air rush through, destroy the vacuum, and spoil the lamp. Platinum expands very rapidly under heat, so, though it is too costly to use for the filament of the lamp, it is used to join on to the filament.

THE POOR MAN'S TREASURE WHICH ONCE KINGS COULD NOT BUY

While all these fittings are being put in, the glass bulb of the lamp is open at the bottom. Now the lamp is put into a wonderful machine, which sucks all the air out of the lamp. The glass is made very hot and soft, and the lamp is then sealed up at the bottom. The little nob at the end of the bulb is the point at which the glass is closed up when the air has been drawn away.

The lamps which many of our lighthouses use are arc-lamps, the great, powerful lamps which send their light far and near over the sea, and warn the sailors of dangerous rocks and shoals. The light known as Barnegat light, off New Jersey, has a light which is said to equal the power of 30,000,000 candles.

All this has happened in a hundred years. A century ago even kings had miserable oil-lamps and dim candles to light up their homes, and the picture on page 652 shows the great Duke of Wellington writing his despatches by the dim light of a candle. To-day even poor people can afford to have their homes lighted by gas.

The next stories of men and women are on page 757.

WHAT THIS STORY TELLS US

WE read here of the way in which life became clothed—that is, of the making of the body. The first animals were never able to do much in the world, for two reasons. They lived in the sea and could not get enough oxygen, and they had no backbone, and no animal without a backbone has ever been of much importance. The backbone is the chief factor in the making of our bodies, and in these pages we learn to divide animals into two great classes—those that have a backbone and those that have not. The earliest backboned creatures are the fishes. Above them are animals that live on land or in water, such as the frog, which is born a fish and becomes a reptile. From these, the evolutionist tells us, came two great branches—on one side reptiles, such as the tortoise and the snake, which gave rise to the birds ; and on the other side the mammals, at first humble, like the kangaroo ; then more important, like the elephant ; and at last the highest order of animals, such as the ape. Then the earth was ready for man, its master.

THE MAKING OF THE BODY

CONTINUED FROM PAGE 518

IF we think of a number of different animals, such as an elephant, a bird, a bee, and a serpent, we see how very different the bodies of animals may be, and yet, perhaps, we shall find that even here there is order, and that the points in which the bodies of different animals agree are more important than those in which they differ.

If we could summon before us all the animals that exist, and look at them carefully, we should be able, in spite of all their differences, to divide them up into two great classes, so that all the animals in one class would be far more like each other than they would be like any animal in the other class. In the one class we should place all the animals that have a backbone, and in the other all that have not.

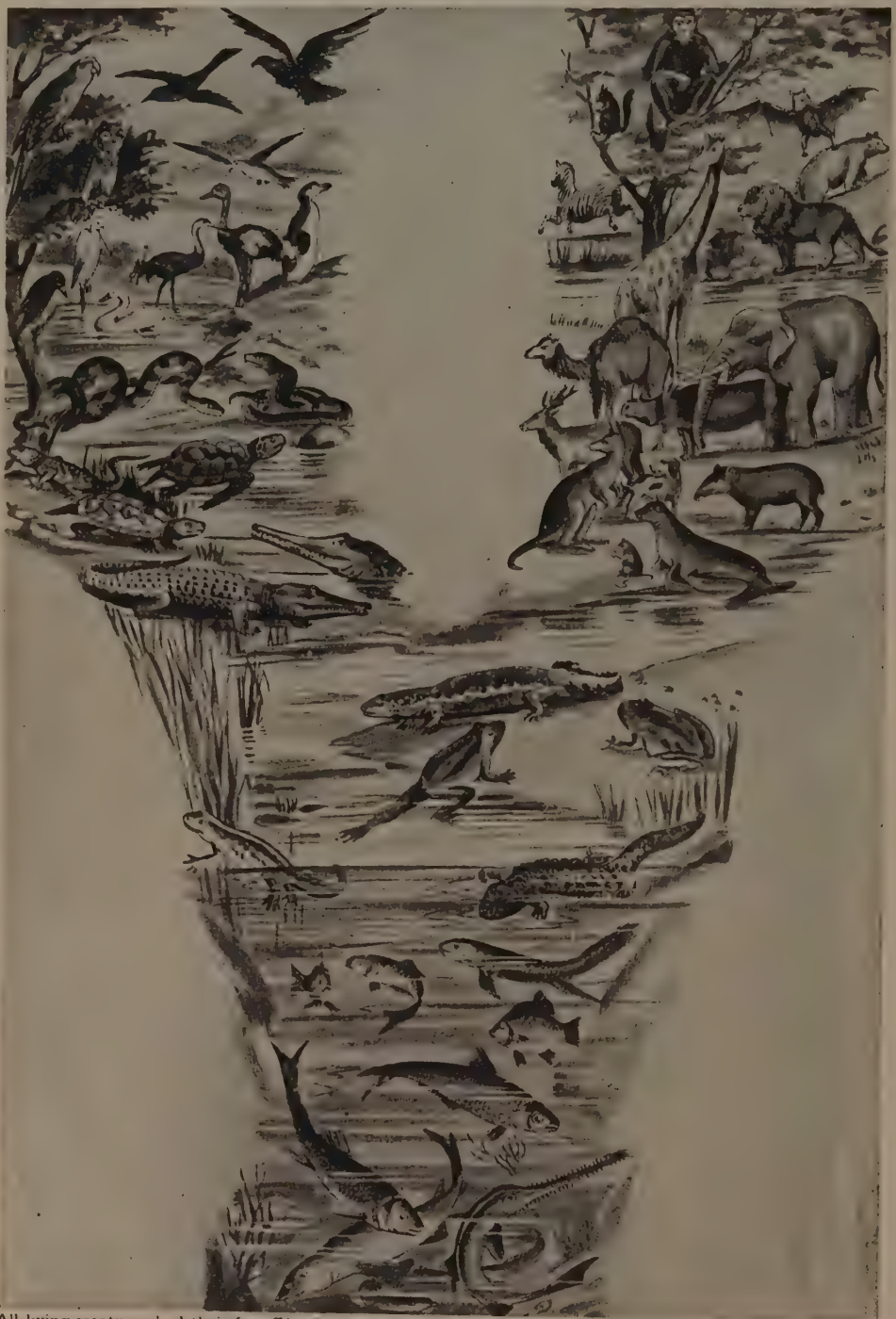
It is true that we should find a very few animals about which we could not be sure, or, rather, which we should have to place between the two classes, for there are a few kinds of animals still living on the earth which have only half a backbone, or something that looks like a sort of rough model of a backbone. These animals are, of course, immensely interesting, because they teach us how the backbone began, and we need not mind that we cannot put them into classes.

Well, now, let us begin first with what are much the least important class of animals—those which have no backbone. We shall deal with them first, because they actually came first. For very many ages there were animals of many kinds living in the sea, and others living on land—these last always cold-blooded—which had no backbones ; and if you had searched the whole earth and all the seas you would not have found a backbone anywhere—any more than you would have found a brain. You might as well have gone looking for a brain or a backbone amongst the plants as in the animal world of those distant days.

These animals which have no backbones are very difficult to arrange in any kind of order. Some of them are more wonderfully made than others, and have not existed on the earth so long. But they differ from each other so widely that it is really quite impossible to arrange them in a simple order. In any case, however, these backboneless animals, such as insects, oysters, and worms, are very humble and unimportant.

As we have hinted, none of them has a brain. This does not mean that they cannot feel, nor that some of them, such as the bees, are not very wonderful in many ways ; but, after all, until that great thing called the brain came into existence, no great progress could be made. So we need

THE ANIMAL LADDER OF LIFE



All living creatures had their far-off beginnings at the bottom of the ocean. This picture makes clear the later steps in the ladder of life—the steps taken since the making of the backbone, which the first creatures had not. The oldest backboned creatures are the fishes. Above them are animals that live on land and in water. Then there is a split. On the one side the land-and-water animals gave rise to the reptiles, and these gave rise to the birds. On the other side, the land-and-water animals gave rise to the mammals.

here say nothing more about the backboneless animals.

Nor need we here say anything about the curious kinds of animals which show us the first hints of a backbone. In some ways they are among the most interesting animals in the world, because small beginnings that lead to great things are always interesting. But here, whilst not forgetting that the earliest backbones were very rough and imperfect things, we may begin with those animals, very well known to everyone, in which first a complete backbone—though a very simple one—is to be found, and these are the fishes.

THE FIVE GREAT CLASSES OF ANIMALS WITH BACKBONES

If now, beginning with the fishes, we study all the different kinds of backboned animals that exist, we find that though there are many thousands of them, yet they can all be arranged in a very simple way. More than this, it is possible, quite certainly, to show which class came first, which last, and so on. Many hard-working men are trying to arrange the animals that have no backbone in this way, but they have not succeeded yet.

Here, then, are the five great classes about which there is no doubt of the backboned animals—fishes, amphibia, reptiles, birds, mammals. Now, some of these words are strange, but they are really not difficult, and we shall easily explain them. For instance, if you have not heard of amphibia before, at any rate you know a frog when you see it, and if you have never heard of mammals, it is easy to remember that mammals are animals which feed their young by means of milk, as, for instance, a cow, which feeds her calf. A human mother feeds her baby in the same way, and human beings are by far the highest kind of mammals.

THE HISTORY OF THE ANIMALS THAT HAVE BACKBONES

Now, there are very great differences between a fish, a cow, a sparrow, and a frog; but yet they all agree entirely in the main lines on which their bodies are made, because they all have a backbone. And we shall see soon that they agree in many other things besides. It is true that the fish is cold-blooded, and breathes water (or, rather, the air dissolved in water), whilst a cow or a sparrow is warm-blooded, and breathes air, but so far as the great history of the body is concerned, all these backboned animals are far more like one another than they are like any animal that has no backbone.

Now we want to trace upwards, if we can, the history of these various kinds of backboned animals. The first, we are certain, were the fishes, and though the fishes have given rise to so many creatures far more wonderful than themselves, yet, in the seas in which they first came into existence, they still thrive. There are many different kinds of fishes, as we all know, though all the fishes that we eat are very closely related to one another.

There are many other kinds of rare fishes which few of us have ever seen. But we may take all the fishes as a group, and remind ourselves of the chief facts about them. They are the first animals with backbones; they live in the water and breathe the little air they find in water; they are therefore cold-blooded, and on no account must they be confused with certain strange mammals like the whales, which live in the water but breathe the air above it, and, like all mammals, are warm-blooded.

THE ANIMALS THAT LIVE IN THE SEA ARE NOT ALL FISHES

Again, all fishes have a backbone, which is the principal part of what we call their skeleton; and this skeleton is inside their body, and is covered with soft parts like muscle and skin. This fact, the possession of a skeleton inside the body, built upon and around the backbone, is true of all backboned animals.

Just as on no account whatever must we confuse the fishes with animals like the whale, which is a newcomer on the earth compared with the fish, so we must here give up, once and for all, the utterly wrong notion that all the animals found in the sea are fishes. It is simple nonsense to think of a clam, or an oyster, or a star-fish, or any kind of so-called shell-fish, as true fishes. On the contrary, these animals have existed ages and ages longer in the sea than any fish. They have no backbones, a hint of a brain, and are as inferior to the fish as the fish is to a cow. We have no more right to

call them fish because they live in the water than we have to call a worm a bird because it breathes in the air.

Now, backboned animals very often have limbs—fore legs and hind legs, or arms and legs, or wings and legs—and the making of these limbs is one of the most important facts in the whole history of the body. Soon we shall trace this up from the fishes.

The nearest approach to anything like limbs that we can find in fishes is to be found in their fins. Many men think that certain fishes, which had a long fin stretched right along each side of the body, from head to tail, played a great part in the making of the bodies of higher and later animals, for from these long side fins there were gradually formed, as the ages went on, two pairs of limbs, one pair in front and one behind, which are to be found after this time in all backboned animals.

THE FISH THAT GROWS INTO AN ANIMAL

Now, you remember what we said lately about the great step taken by life when first it "swam ashore." We know even now certain fishes which can get along for some time in the air, and they give us a little hint of what happened, especially since some of these fishes are very clever at hopping along in the mud. If now we turn to the next class of backboned animals, which have that difficult name amphibia, we shall be able to guess what happened.

The word amphibia is really a Greek word, and all it means is "both-life." It is just a word made up to say that animals of this kind, such as the frog, lead both kinds of lives—life in water and life on land. Now, they do not lead both kinds of life backwards and forwards, one way or the other as they please, but each amphibian begins by leading the one kind of life, and goes on by leading the other. So it gives us a hint as to the history of life in the great chain of backboned animals.

When the frog is very young, it is called a tadpole. This lives in water and breathes water. If it never went any further, we should properly call it a fish. While it is a tadpole it is like a fish; but, of course, if it were no more than a fish it would live in water all its days. The tadpole does not do this, but after a time it begins to make great changes in itself; there begin to be hints of limbs and, what is even more important, of lungs; and at last the little tadpole grows up into a frog, which is not a fish, which has arms and legs, or fore limbs and hind limbs, and which breathes air by means of lungs.

THE GREAT-GRANDPARENTS OF THE FROGS LAID THE PLAN FOR ANIMALS

Not only so; but this frog has hands as we have, each having four fingers and a thumb, whilst it has five toes on each of its feet. Indeed, ages and ages ago, the first frogs, or the great-grandparents of the frogs we know now, laid down the plan of the kind of limbs which all backboned animals since then have had; though some of them, like the bird, do not keep this kind of five-fingered limb all their lives.

Now, when the frog is grown from the tadpole, into a back-boned animal with four limbs, breathing air by means of lungs, it is really very like, indeed, to certain of the next class of backboned animals, which are called reptiles. It is not like a snake, but it is like a little lizard—and especially if that lizard has no tail. Indeed, the simplest way of looking at this is to think of the amphibia as fishes when they are young, and reptiles when they are grown up. The young frog or tadpole is practically a fish, because it is made as a fish is made, and does what a fish does. The grown-up frog is practically a reptile, because it is made as the reptiles are made, and does what they do.

WHEN THE REPTILES WERE THE MASTERS OF THE EARTH

Now we leave the amphibia and may pass on to the next class of backboned animals that appeared upon the earth, which were the reptiles, and of these we need not say much, except simply that a great many of the reptiles have gradually lost their limbs and have become very long and round and crawling, until at last they took the shape of snakes and serpents. Nevertheless, snakes and serpents in their very tiniest and earliest stages show that they are the children of creatures that had limbs, and we are quite certain of this. A snake has no limbs that you can see, not for the reason that a worm has no limbs—for a worm never had any—but because it has lost

them and has taken to moving about in a different way.

Now we are getting much higher, and coming to times nearer to our own. There was a stage in the story of life when the reptiles were masters. There was then nothing to beat them. They grew to great sizes, and if you go to museums you may see the remains of their bodies, sometimes sixty feet long. Some of them, especially the smaller ones, grew great stretches of skin between their outspread fingers, a sort of web such as we find in the feet of many swimming birds, and so they were able to fly more or less. Some of them were perhaps very fierce and powerful, and they had terrible teeth in almost endless numbers. It must have been a very strange earth in the age of reptiles.

How the Birds First Came into the World

But then, somehow, a most wonderful thing happened. This was guessed at long ago, but it was proved only last century, especially by the discovery of the remains of certain curious animals which do not now live upon the earth at all. If you think of a snake, and then of a lark, it would certainly never occur to you that the birds have sprung from reptiles; but if, instead, we take a reptile, such as a small lizard, which has not lost its limbs, and if then we look at the remains of certain creatures which once existed, we discover that actually the wonderful birds have sprung from the reptiles. Of course, there are a great number of very marked differences between reptiles and birds, both in what they look like and in their ways of life. No bird now living has teeth, for instance; birds have feathers, and so on. But yet, when we discover the remains of birds which did have teeth, and so on, we learn that this is really true. The great class of birds have sprung from the reptiles.

Lovers of birds are almost inclined sometimes to place them on a level with the mammals themselves, and it is true that in some ways the birds are equal to the mammals, and in some ways even superior to them. But really no one, not even the best lover of birds, questions that the highest group of animals, the highest group of living things of any kind, are the mammals. Where did they come from?

Now, it seems most likely that the mammals did not spring, like the birds, from the reptiles, and it is quite certain that birds did not spring from mammals or mammals from birds. Indeed, we must go right back, not so far as the fishes, but at any rate as far as the amphibia, in order to find where the mammals have sprung from.

The Great Upward Climb of the Animal World

The picture on page 660 shows us how from the fishes there sprang the amphibia; how from some of the amphibia there sprang the reptiles and birds; and how from others of the amphibia there sprang the mammals. Of these, the earliest led a hard life on the earth, I believe, even during the age of reptiles.

They cannot have had anything like the strength of the reptiles, but yet they survived and flourished—partly by keeping out of the reptiles' way, and by going to corners where the reptiles did not want to live, but more especially because of the great care they gave to their children—a care far better and finer than anything to be found in the whole of the rest of the world of life. And so they went on from strength to strength, until now, man, the highest of the animals, is the master of the earth.

Now, throughout all these long ages, while so many changes have been happening, and so many different kinds of animals have come into being, nothing has ever happened to do away with the backbone.

The Chief Factor in the Making of Our Bodies

On the contrary, it has steadily become more and more perfect. You know quite well what the backbone of a herring is like; it is a very useful thing, without which no herring or other fish now living could grow; but it is very simple, and only fit for a creature which leads a very simple life, and from its birth to its death it makes practically only one kind of movement.

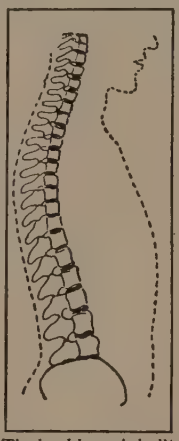
As we pass upwards we find, in the frog, for instance, that the backbone is becoming at the same time stronger and less simple, and as we pass up higher still we find this process going on, until in a mammal the backbone

is so far from simple that you might spend a lifetime in studying it.

In ourselves, as in the fish, it is the chief factor in the making of our bodies. It is something like the keel of a ship, upon which everything else is built; but it is, at its simplest and smallest and weakest, a million times more wonderful than the keel of the biggest ship that ever was or ever will be made.

THE BUILDING UP OF THE BACKBONE OF THE BODY

You know quite well that the backbone is not really one bone, but is made up of a great number of little bones laid in a line. Indeed, these little bones are built or placed on one another, just as you may place a number of stones upon one another to form a column, when you are making a building. For this reason the backbone, or spine, as it is often called, is quite as often called the spinal column. The little bones of which it is made have the not really very difficult name of vertebræ, a single one being called a vertebra, and the scientific name for animals that have a back-bone is Vertebrates, while those which have none are called Invertebrates.



The backbone is built up of many small bones. This shows the backbone and its place in the body.

Now, we must say just a word or two more about the limbs of backboned animals. These limbs have bones in them, and these bones are joined or jointed on to the backbone, just as the little bones which make the backbone are joined or jointed with each other. As we saw, these limbs really arose from the side fins of the fish.

HOW THE ANIMALS MAKE USE OF THEIR WONDERFUL LIMBS

All backboned animals above the fishes either have two pairs of limbs all their lives; or have them at the very beginning and lose them afterwards, like the snakes; or have them when they are grown up, but not at first, like the frog. No back-boned animal ever has more than two pairs of limbs.

The serpent loses its limbs, the whale turns its fore limbs into flappers, and in order to find its hind limbs, or legs, which have fallen out of use altogether, you have to dig deep in its blubber, or fat, but you will find them all the same—toes and all. The birds have learnt to turn their fore limbs into wings. When the chick is very, very young indeed, it has five fingers on each hand, like its forefathers, but later on it finds that these are more than it needs to build a wing upon, and when it is grown up we find that the wing is really only built upon three and a half fingers. The other one and a half have disappeared, since they were not wanted.

The use of limbs is for movement; but if we trace limbs upwards from the days of the frog, or at any rate from the days of the earliest mammals, we find that the fore limbs get to be used not only for movement, but also for other purposes. For instance, we know for what terrible purposes the tiger uses his claws. If we go to a higher mammal than the tiger—as, for instance, to the monkey—we find that he does much more with his fore limbs. The cleverest lion or tiger, though it will steady its food with its claws while gnawing at it, cannot pick up its food in the way that we can and take it to its mouth. The monkey does this; it has learnt the great art of grasping. In the monkey the fore limbs are at least as important for grasping as they are for moving about on.

In man the spinal column has been made into a real column because it stands upright, and only tiny babies now use their fore limbs for walking. Once the crawling stage is passed, our arms are freed for ever from purposes of walking, and are used instead as the great servants of the brain, so great that without them man could have done nothing in the world, and, indeed, would have been starved and hunted out of the world by animals long ago.

It is almost impossible to say how important is the freedom of man's arms, or fore limbs, from the mere purpose for which he now uses his feet, and for which the hands of all other backboned animals have been used for so many ages. But the hands of men, as we said, are the servants of the brain and the nerves.

The next part of this is on page 781.

WHAT THIS STORY TELLS US

THE great power of man over the animals comes from man's mind. Man can think and make up his mind; he can remember yesterday and prepare for to-morrow. Yet often when we read of animals we must wonder whether animals have not a mind. The wonderful things they sometimes do can only be done by creatures which think and plan and act with a purpose. Such clever little builders as we read of in these pages must have something like our brain—the beginnings of a mind, perhaps. Certainly they must be a great deal higher in creation than the fishes, and a great deal better workers, perhaps, than some men. We read here of the wonderful homes they build for themselves across streams, on the banks of lakes, and down underground, and the story of their building, although we know that it is true, reads like an animal fairy tale.

NATURE'S LITTLE WORKMEN

BEAVER, COYPU, PORCUPINE, CAPYBARA, AGOUTI, CHINCHILLA, JERBOA, JUMPING HARE, MARMOT, PRAIRIE DOG, VISCACHA, POCKET-GOPHER, MOLE & SHREW, WATER-SHREW, DESMAN

CONTINUED FROM PAGE 608

IF you looked at a list giving all the trades which men and women in this country follow, you would be surprised at some of the kinds of work mentioned in it. "I did not know that there were such trades," you would say. If you could have a list of the ways in which Nature's little workmen earn their living and provide their homes, you would be still more surprised.

We have fire and gas and electricity and tools and machinery to help us, but animals have nothing but that which Nature gives them. It is quite enough, too. There is a fish which can give you an electric shock as strongly as an electric battery. We have tailors; but there are tailors among the birds who make their own thread and sew with their bills. Man can use a gun, and throw a stick or a stone in the chase; there are fishes which shoot flies, squirting water, which drenches the fly, and makes it fall into the mouth of the shooter.

Another fish angles as artfully as men angle. It has on its head little growths which look like worms that the little fish love to eat. The angler-fish sinks to the bottom of the water into the mud or reeds, but lets these little worm-like growths stick up above his hiding-place, until the fish, attracted by what they think to be worms, swarm around. Then the big fish pops up from the mud and catches them.

We preserve food of all sorts for future use; so do beasts and birds and insects. We build cities; so do numbers of animals and insects which burrow in the earth. We love to have our homes beautiful; so do birds, and some animals. Humming birds decorate their nests with pretty coloured lichens, but the satin bower bird builds a handsome little assembly hall, like the arbours which we see in old gardens. Here he places pretty shells and white stones, bright feathers from other birds, and anything he can find that looks gay and pleasing. This is not his nest—that is built in another place—but a meeting-place where the birds may pass their time amid scenes which please them.

We shall learn much more of these wonders later. Here we have taken just a peep at some of them, so that we may not think that the little workmen about whom we are going to read are the only masters of arts and crafts in the animal world. The fishes and birds and insects we will leave till a later day; here we must look into the doings of animals with which we are familiar, and some which are strange.

The beaver is common enough by name, but it is not an animal commonly seen. It lives mostly in North America and Canada, but it was once abundant in England and Scotland and Wales, as well as in most countries of Europe; but men have

so cruelly hunted it that only a few are now to be found out of America. To tell the truth, it would be rather dangerous to have it plentiful in countries where people live near the rivers. It does its work so well in the rivers that it would cause men's homes to be flooded.

How the beavers set out to build themselves a home

Looking like a great water-rat, the beaver is about two feet long, and has a tail which is unlike that of any other animal. This tail is ten inches in length. It is flat, and has scales instead of hair, and weighs about four pounds. It is the rudder with which the beaver steers when swimming, and it acts also as a support when the beaver sits up to work or to eat. To understand the work of the beaver, let us picture its life.

A couple of beavers set out to make a home for themselves. They must be near water, for they love to swim in it. Their hind feet are webbed like those of a duck, specially for swimming. Not only do they like the water, but part of their food grows under water. Here, then, are our beavers swimming down the stream, until it brings them to a wood in which are willows and other trees that they like. It is a good place for a home, so they decide to settle.

All would be well if the conditions did not change; the beavers might make a hole or two under water into the banks of the stream and live happy ever after. But they know that a stream is not always the same. In the summer, when there is little rain, there will be little water in the stream, not enough to swim in, and so low that their holes in the banks would be left exposed; then their enemies, the otter, the wolverene, and man, could easily find them.

How the beavers get the wood to build the dam

In some strange way the beavers know this as well as a man would, and they at once set to work to do as a trained engineer would. They start to build a dam or wall across the stream. This will prevent the water from flowing away when the weather is dry; and when the floods come, by an opening in the dam, the beavers can let off enough water to prevent their homes from being swamped.

Where are they to get materials? It is growing all about on the banks. The trees are the building material. The beaver has wonderful teeth with which it can cut down trees. The outer edge of the teeth is formed of the hardest enamel; the inner side is of soft ivory. The result of this is that the inner side of the tooth wears down in biting, leaving the outer edge hard and sharp, like our finest steel chisels.

With his sharp teeth the beaver now goes to work upon a tree which is overhanging the river. He sits up on his hind legs, and rests his forepaws on the trunk of the tree; then he gnaws away in a ring all round the trunk. If you have seen an hour-glass you will know the sort of mark that the beaver makes in gnawing through a tree. He bites all round so smoothly that pieces of wood cut through by beavers at the Zoo appear to have been cut by hand.

When he sees that the tree is going to fall, the beaver either darts into the water, or runs to some other safe hiding-place. Down comes the tree, then the beaver sets to work to bite off the branches and to cut the trunk into logs.

How the beavers throw an arch across the stream

With these logs he begins building across the stream. The logs are laid flat. Then the beaver dives to the bottom of the river, or goes to the bank, and brings mud and stones to plaster the logs and make them secure. It gathers up the mud with its forepaws, and, holding it under its chin, so carries it. They work very hard, and soon the result of their work begins to appear. The boughs of the tree are stripped of their bark—for that is good for food—and then they are woven into the dam. In this way the beavers work away until they have got a wall of logs and branches, fastened together with mud and stones, right across the stream.

If the stream flows gently, the dam is built in a straight line from bank to bank. If, however, the stream is a rapid one, it will cause greater pressure on the dam. The beaver, in this case, builds his dam with a curve, the middle of the curve facing up-stream. You know how strong an arch is; well, the beaver makes his dam into a sort of arch, lying on its side. As the water flows it brings down driftwood, soil,

SIX LITTLE ANIMALS WITH POWERFUL TEETH

The agouti is a sort of big, long-legged guinea-pig from South America, which does good when it eats the weeds, but does great mischief in the sugar plantations.

The capybara is the biggest of all the rodent family. Its fat, heavy body is so thick that it nearly touches the ground. It is clumsy on land, but swims beautifully.

The marmot, which is about the size of a rabbit, lives in rough burrows on the mountain-sides. When winter approaches a dozen or more will build a winter home and store up an abundant supply of food.

Swarms of prairie dogs, which are really marmots, live in burrows on the plains of North America. On the entrance to each a marmot sits as sentinel. When danger threatens he warns the other with a yelp.

Viscachas live in colonies in South America, and burrow regular villages. These animals decorate their homes with bones, bright stones, and the like.

The pocket-gopher gets its name from possessing two little pockets, one on each side of its face. In these the gopher can store its food until it has enough time to eat it.

and other matter with it. All this is built into the dam by the beavers, so that it becomes in time a very big barrier. An opening is left at the top for the water to escape. Some of it, however, will flow on to the land lying on both sides of the river. This is just what the beaver wants.

After a time he has cut down all the trees on the river-side, and he finds the task of rolling or pushing logs of trees cut down far from the stream a difficult one. When the water flows inland he makes little canals with it. He makes proper channels, or deepens those which the overflows have caused, and into these channels he rolls the logs which he has cut, and so is able to float them down to his dam. By this time the beavers have got a pond or lake in front of their burrow. The water is too deep to freeze to the bottom in winter, so the beavers will not have their homes frozen in. Now they can set to work to make a proper dwelling.

THE BEAVER'S LITTLE HUT AND THE TUNNEL LEADING INTO IT

They build a house which is like a small hut. The same sort of material is used for this as for the dam. Logs and branches and mud and stones are beautifully built together, with a thick plaster of mud over all. When the frost comes this mud freezes as hard as rock, and the beaver is secure from his enemies. But how is the beaver to get in and out? There is no way in from the land. That is part of the beaver's plan. He makes two tunnels down in the earth leading from his home into the water. One tunnel serves when the water is all right. The other tunnel comes out lower down in the water, so that, if in the winter the water is frozen round about the top tunnel, the other will still be free. He can come out by this winter passage and go to the store of barks and twigs which he has hidden under his dam.

Inside the little home is as neat and nice as possible; it is about a yard in height from the floor to the top of the roof, and six or eight feet wide, and the walls and roof are thick, so that the home is like a little fort. Grass and twigs form carpet and beds, and here father and mother and baby beavers are as snug and happy as their skill and hard work entitle them to be.

There are not very many beavers now, for they were so constantly hunted for a long time that they have nearly all disappeared near the homes of men. People used to make beaver fur into hats, and their skin into slippers and waistcoats.

A BEAVER'S HOUSE WHICH CAUSED GREAT FLOODS IN CANADA

Beavers can quite alter the character of a place where they make their home, therefore it would be impossible for them to live near the haunts of men. They are bound to dam the rivers if they are left to themselves, and that means that the surrounding country becomes flooded. Not long ago some beavers set up house in a river near a railway in Canada. Their work caused the river to flood the country round about, and wash away part of the railway embankment. This would have been dangerous if allowed to go on, so the railway men cut through the beavers' dam, and let the water run off. The beavers repaired the damage. Again the men cut it, and again the beavers repaired it. Fifteen times the beavers repaired the damage, then they found that it was useless to build any more, so they gave it up and went away.

The beaver has rich brown fur, though sometimes black ones are found, and sometimes even white ones. They work at night when their enemies are not about. They are the most famous of a large family of animals called rodents—that is, animals which gnaw.

THE COYPU, AND THE TUNNEL IT MAKES IN THE RIVER-BANK

One of the family which is something like the beaver is the coypu. This is about the same size as the beaver, and lives in water, but instead of making a hut and a dam it is satisfied with a tunnel from the bank into the water. It swims beautifully, and without any noise, just like the beaver, but it does not make a flapping noise on plunging in, by striking its tail flat on the water, as the beaver does. The coypu's fur is as much prized as that of the beaver. It is a very good mother, and when it wishes to take its babies out for a swim, carries them on its back until they can go into the water without its help.

After looking at a coypu, which resembles a beaver, you would hardly expect to find that it belongs to the

same family as the porcupine, but it does. The porcupine does not swim, it has not fur like the coypu, but long, sharp prickles or quills, yet it belongs to the same family as the coypu and the beaver. They are all rodents—that is, animals which gnaw, like the rat and the rabbit. Its gnawing makes the porcupine a relation of the beaver.

How the Porcupine Defends Itself from Its Enemies

It has splendid teeth like the other rodents, but it never uses them as a means of protecting itself. It seems to say to its enemies, "I can hurt you if you attempt to hurt me, but I do not wish to attack you."

The Old World porcupine, which is found in parts of Europe as well as in Africa and India, is a moderate-sized animal, and grunts like a pig. Its spines vary in length. The longest are not the strongest. Those which do most damage to an enemy are from five to ten inches in length. When it is attacked, the first thought of the porcupine is to protect its nose, which is very tender. Then it causes its quills to stand upright, which makes it look a terrible beast. If it cannot get away it curls itself up in a ball like a hedgehog. A hungry tiger or leopard will occasionally try to kill it, but it is a bad day's work for the animal which does attack. The quills press into the enemy's flesh, and as they are easily loosened from the skin of the porcupine, they stick where they have entered the flesh, and cause bad wounds.

The Porcupine with a Tufted Tail and the Porcupine which Climbs a Tree

Savage animals, when dead, are sometimes found to have the quills of porcupines fastened in them. This led to the belief that the porcupine could shoot out its quills, but that is not the fact. They become detached from the animals in the way that we have described. At other times, if the spines are loose and old, they drop out when raised to meet an enemy. The porcupine never attacks another animal. It comes out of its hole in the ground after dark, and eats roots and plants and the bark of trees. It can do without water, if the juice in its food is sufficient for it.

Strange as the ordinary porcupine looks, the tufted-tailed porcupine is stranger still to see. The quills of this one, instead of being round, are flat like swords. The tail is scaly for the most part, but at the tip there is a bunch of soft quills which, though of no use as weapons, may serve to frighten other animals. This one lives in India and in Malacca, and has been found elsewhere.

Canada has a porcupine which climbs the trees. Its food consists of the bark and leaves of trees. Beginning at the top of a tree, it works its way from branch to branch right down to the root, eating all the leaves, and stripping off every bit of bark. This kills the tree. The porcupine is well known in the Northern United States also, and the quills the Indians use in ornamenting baskets are from this species.

The big porcupines have only small tails, but there is a porcupine in Brazil which has a long tail, like an American monkey, and uses it in the same way, winding it round the branches of trees to help it in climbing. In the days when there were no foresters to cut down trees, the work of the tree porcupines would be of benefit, as if trees grow too thickly in the forests they die. The thinning out of their number would be for the good of the rest. But when tree after tree is taken it is very serious.

Some Little Animals that do Good and Bad by Turns

There is another animal which does good and bad by turns. This is the capybara. It is like a great big swimming guinea-pig. It is the biggest of all the rodent family, its fat, heavy body being three feet in length, and so thick through that when the capybara walks it nearly touches the ground. It is clumsy on land, but in the water its webbed feet carry it along beautifully. It is a wonderful diver, and can remain under water for some minutes at a time. As it eats only vegetable matter, it does good work in the rivers of South America by keeping the banks from being overcrowded with vegetation and the bed of the stream from getting choked up.

That is good work, but when the capybara forsakes the river, and runs wild in the sugar-canes which men have planted, then it does great damage, and that is a reason why men hunt it. The other reason is that its flesh is good to eat. The capybara can be tamed, and makes a pleasant companion in the lonely wastes of South America.

Another animal in the same part of America which does good and bad by turns is the agouti, which does good when it eats the overcrowded vegetation of the forest and swamp, but becomes an enemy to man when it gets among his sugar plantations. The agouti is a sort of big, long-legged guinea-pig, but it has a tiny tail, which the guinea-pig has not. It is very nimble, but it cannot keep up its pace for a long run.

The long, thin legs of the agouti bring to mind some more famous rodents—the chinchilla and the jerboa. The chinchilla has lovely fur, which is much liked by ladies. It has this warm fur because it lives high up among the mountains of South America, where the weather is cold. It is a dear little animal, and very clean in its habits. After it has done a little burrowing for its home, it will come out into the open and carefully wash its fur, so that not a speck of dust shall remain upon it. The chinchilla is classed with the same family as the jerboa. Both chinchillas and jerboas are great jumpers. They jump not with all four feet, but with the two hinder ones, like the kangaroo, and their tails help to balance them.

How men catch the jumping hares in Africa

The jerboas do not live in America, but in Asia, and East Europe, and Africa. They make homes in the dry ground, and are wonderful to watch when making their flying leaps through the air, but they do much damage where grain is grown.

The biggest of them all is the Cape jerboa, called also the Cape jumping hare. It burrows in the sides of mountains or on warm, sandy plains, and, unless checked by man, multiplies exceedingly. So much harm does it cause to crops that men have to hunt it for their own protection. Nothing can catch it as it bounds about, many feet at a time, among the rocks, so men practise a trick. As soon as the jumping hares see men, they all dash into their holes. Then men pour water down the burrows. This so frightens the animals that they rush out, and are caught. The jerboas take men's crops not merely for present use, but for their winter food.

In this respect they are like the Asiatic marmot, which provides for the winter. But the marmot takes only grass, which is converted into hay, and so kept for the long, cold days when green food is not to be had. During the summer months the marmot, which is about the size of an average wild rabbit, and rather like one, lives on the mountain-sides, where a rough burrow is good enough for its home. But when winter is coming on a dozen or more set to work to build a winter palace. First of all they make a long underground passage, which opens out into great central chambers. Here the food for winter is placed and a safe haven of rest made.

The swarms of prairie dogs on the plains of North America

When the snow falls upon the mountains, the marmots scurry into their nice warm home. They close up the passage which leads out into the cold, filling it up with earth and hay. Then they are safe and snug and warm, and can go to sleep for the winter, waking up every now and then to eat a meal of the nice hay which they have stored.

The prairie dog is really a marmot. It is called a dog because, when alarmed, it makes a little yelping sound like a tiny dog. Swarms of prairie dogs live in burrows upon the rich plains of North America. They have scores of burrows, all bored deep into the ground, each burrow being crowned at its opening by a big mound of earth. They are busy little animals, and rush about from burrow to burrow all day. But on the top of each mound a marmot sits as sentinel. If danger approaches, he gives a sharp yelp, and in an instant all the marmots rush down their burrows, and not one remains to be seen. Soon, however, a scout will come out, and if all is well he gives a sort of whistle, whereupon the others all troop out to resume their work.

A wonderful animal city built under the ground

Sometimes a rattlesnake will make a visit upon the prairie-dogs. The marmots cannot say "no," for they do not fight other animals, so there the visitor stays. But he is a bad guest, for he eats the young marmots.

A similar thing happens in the home of another rodent, the Argentine viscacha. Into this underground home goes the Argentine fox, to eat a young viscacha whenever it desires. The wonder is that the viscachas are not

THE PORCUPINE AND THE GREAT JUMPERS

The tufted-tailed porcupine differs from its cousins in having a tail with a bunch of soft quills at its end. Though these are harmless they may serve to frighten its enemies. The quills of this Brazilian porcupine are flat like swords.

When a common porcupine is attacked its first care is for its nose, which is very tender. Then it erects its spines, which make it look a terrible beast. Sometimes it curls up like a hedgehog.

The Canadian porcupine is a tree-climber, and its food consists of the bark and leaves. Its tail is short, but strong, and forms a weapon.

The Cape jumping hare is a kind of large jerboa, which burrows in the side of the mountains or on sandy plains and multiplies rapidly. It can leap several feet at a time.

The pretty little jerboa is a wonderful jumper, and has long, thin hind legs like a kangaroo. Its tail helps to balance it, as we see in the picture. Jerboas live in burrows in deserts.

The chinchilla, like the jerboa, has lovely fur, and makes a most delightful pet. It is as careful as a cat in keeping its fur perfectly clean.

clever enough to get rid of such an intruder. They are clever enough in other ways. The viscacha makes its home on the Pampas, where it burrows a regular city, which, when finished, often covers a space of 200 square feet. As the soil is brought up from below, it is carefully deposited so as to form a great mound round about the entrance to the burrow.

THE VISCACHAS LIVE TOGETHER IN LITTLE VILLAGES IN THE EARTH

In order that this may be done, the viscacha first makes a trench straight out from the burrow, along which it carries the soil. Presently it makes a trench from the end of this first one, but branching off to the left; then it makes another branching off to the right, so that the paths approaching these underground dwellings are shaped like a capital Y.

Many passages are made underground for the work. These lead to large chambers, from which other passages run off, and there may be more big chambers at the ends of these. All round the entrance to the burrow the herbage is kept cropped close, so that the animals can see if an enemy approaches. They live together, several villages adjoining, in perfect friendship. Should any accident happen, by which one village gets closed up, the viscachas from the next village are said to rush up and dig out the prisoners. The inhabitants of one village will visit another village, but they never go into each other's burrows.

They lived in this way on the plains long before men had their farms there. It was the constant cropping of the grass by these little animals which made the herbage so rich and good and fine, and because of that men were able to pasture their sheep upon the land.

THE UNDERGROUND HOUSE-BUILDER WITH TWO POCKETS FOR FOOD

But the poor viscachas cannot remain near men's homes. They have made the grass fine and good, but they eat so much that they ruin a sheep-farm, therefore they have to be driven away or killed. It is another case where animals were doing Nature's work until man came with his tame animals, requiring all the food that the land can furnish.

One other curiosity about the viscachas we must note. They like to decorate their homes as the bower bird does. They collect everything they can find—bones, pieces of rock and stone and all sorts of things. If a man loses any of his property near where these animals live, he presently goes straight to their burrows. They will have found it and carried it away as part of their decorations.

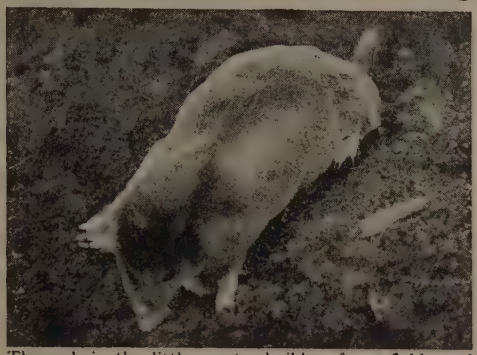
Another of the house-builders underground is the pocket-gopher, which is such a pest to farmers in the western United States. Its odd name means that it has two convenient little pockets, one on each side of the face. In each of these the gopher can store food. Thus, if it finds something good to eat while it is busy tunnelling, it need not stay to eat it then and there, nor need it waste it; the food is popped into the pouch and kept there until the gopher is ready to sit down to dinner. He lives almost entirely underground, so that his eyes and ears are very small. His claws are very big and strong.

HOW THE GOPHER CARRIES HOME A LOAD OF FOOD

He makes his home very skilfully, working head first into the burrow, and finishing all smooth and straight as he goes. As he is burrowing into the solid ground, of course the soil which he scrapes away must go somewhere. He pushes it under his body and back behind him as he works. Presently he turns round to clear up. He fastens his front paws together under his chin like a shield, then with his hind legs he presses forward, and the loose earth is pushed out of the hole.

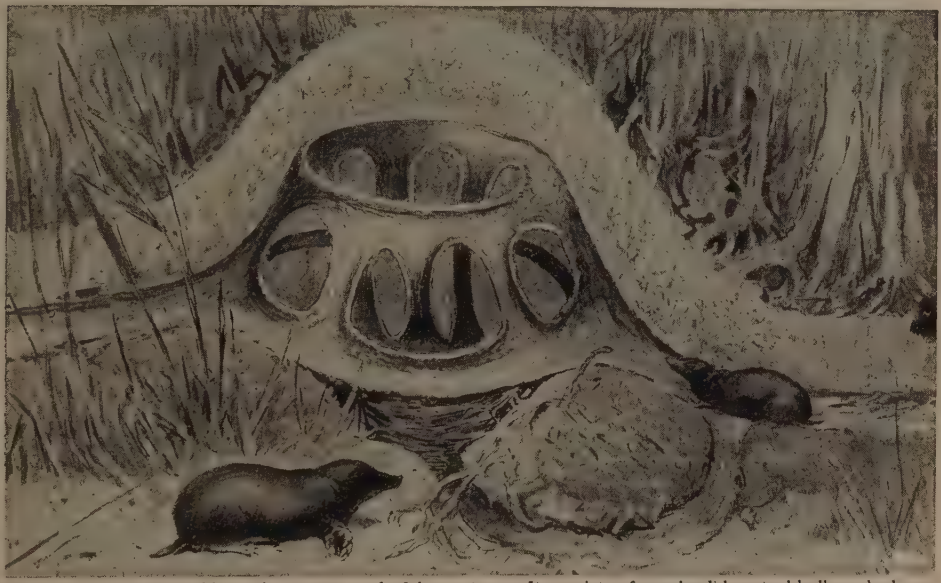
There is another strange thing about the gopher—he can run backwards just as easily as he can run forwards. When he is carrying food to his storehouse he need not turn round to carry it back; he simply trots backwards, then comes out head first again, gets some more food, and trots backwards with it again once more. Of course, he can carry quite a load in this way when both his pockets are full. If the pieces are too large, or have sharp corners which would hurt, he gives them a nip or two with his sharp teeth, then pops the pieces into his pocket. When he wishes to take out the food, he presses his front paws against the sides of his face, and it topples out before him.

THE MOLE AND ITS WONDERFUL HOUSE



The mole is the little master-builder of our fields and gardens, and is a wonderful little workman. He eats worms and grubs which would do injury to the farmers.

The desman is a kind of shrew with webbed feet, and with a tiny trunk for a nose, like a very small elephant's trunk. It feeds on small fish, worms, and insects.



The mole's underground home is a very wonderful structure. It consists of a splendid central hall, arched over with a vaulted roof, and with five or six entrances. The mole also constructs a special nursery for its children. The tunnels and hall are made strong and smooth, and they do not fall in, even though great rainstorms should soak the earth. The mole also makes long burrows underground in search of worms.

The shrew is a pretty little animal, not quite three inches long, with a pointed nose, and a tail about an inch and a half long. It makes a snug underground nest.

The water-shrew is very much like its land cousin in appearance, but it lives largely in the water, where it dives cleverly. It makes its home on the river-banks.

The photographs in these pages are by Chas. Reid, Lewis Medland, W. P. Dando, and D. English.

All this talk about the burrowing of animals abroad must have made you think of that little master-builder in our own fields and gardens—the mole. He is as wonderful a workman as any of them. Indeed, no burrowing animals make a more beautiful home than this little friend of the farmer. All that we see from the top are little mounds of earth, which we call mole-hills. They are simply shafts which the mole has tunnelled from below to throw up the soil which his great claws have dug.

THE GREAT WONDER THAT LIES BENEATH A MOLE-HILL

Nothing but a picture can give you an idea how wonderful are the works of the mole. He has tunnels running in all directions, all made on the strongest and most beautiful plan. Some are short cuts by which he and his family can dart away in time of danger. Others are long highways leading, on careful plans, all about his underground estate. He has a splendid central hall, arched over under a vaulted roof, and with five or six entrances. He has a proper nursery for his children. If you have tried to make a building of sand or soil, you know how hard it is to keep the place from tumbling down. The mole has only soft soil in which to work, but in it he makes his great tunnels and his lofty hall smooth and hard; and they do not fall in, even though great rainstorms should soak the ground.

That is the mole's work. His pleasure is in eating and in getting food for his family. He eats worms and grubs, which would do great injury to the farmer. Of course, he can miss his way, and throw up hills which will spoil the finest lawns or pastures. That is bad, but he makes this good by his work in the borders and in the fields.

HOW THE MOLE MAKES A TUNNEL AND SINKS A WELL

To show how he can tunnel, this story will help you. A gentleman has a big conservatory, in which he grows peaches and strawberries and grapes. He could not imagine how it was that the soil used to get so cut up and tossed about in the conservatory. But his gardener found that moles were at work. They had runs out in the grounds, and, finding that worms and grubs were to be had in the soil of the greenhouse, they burrowed under the foundations of the building and into the conservatory. This could not be allowed, for it did damage, so traps were set. In a fortnight the gardener caught a dozen moles in that conservatory.

Have you heard people say "as blind as a mole"? They do not know anything about the mole when they say this. The mole, like the bat, which is also believed to be blind, can see. It has tiny eyes set deep in its fur, so that they shall not be injured by the soil.

You would not die of thirst if you could set a mole to work as engineer. Its keen sense of smell enables it to find water at once. It sets to work with its splendid claws, and sinks a well to where the water is.

If you find a long, little burrow just under the surface of the ground, you must not think that you are looking at one of the walks of our little friend the mole. That may be the tunnel of the shrew, which makes a nice little round passage with a snug nest at the end of it, but not on such a big scale as the mole's. The shrew is a pretty little animal, not quite three inches long, with a long, pointed nose, and a tail about an inch and a half in length, which does not taper away as a mouse's does.

THE LITTLE SHREWS THAT FIGHT UNTIL ONE KILLS THE OTHER

It is supposed to be terribly savage, but it is not unless one male shrew meets another male shrew. These two fight until one is killed. Otherwise the shrew is a cheery, good-tempered little fellow, and not so fierce as the mole. It has many enemies, and so is bound to make some efforts to save itself, or the whole family would soon be killed. Owls will eat it, but, though cats will kill it, they will not often eat it.

This shrew lives only on land, but there are shrews which live in the water as much as the beaver does. We have several sorts of water-shrews in America, but none is so remarkable a shrew as the desman. This is a shrew with webbed feet, and with a tiny trunk for nose, like that of the smallest of small elephant's trunks. The nose serves the desman in many ways.

The food of the desman consists of small fish, insects, and vegetable food, most of which it can get in the water where it passes its day.

The next story of Animals is on page 765

HOW THE BEAVERS BUILD THEIR HOMES

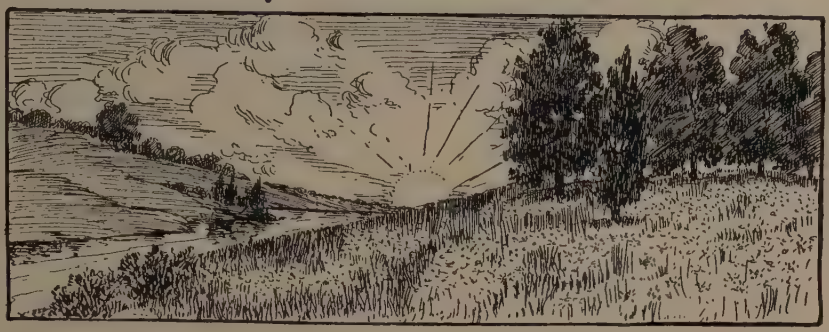
The coypu is one of the largest relatives of the beaver, which it is somewhat like in appearance. It lives in the water, but instead of making a hut and a dam it is satisfied with a tunnel from the bank into the water.

The beaver looks like a great water-rat, but has a flat tail covered with scales instead of hair. This is the rudder with which the beaver steers when swimming, and it acts as a support when the animal sits up to eat.

Here we see a beaver-dam on a stream in Canada. The dam can be seen in the distance, made of sticks and mud, and stretching from one bank to the other. Notice the three large trees. Their trunks have been partly gnawed through by the busy little beavers, and they will soon fall and be cut up to enlarge the dam.

GREATEST OF EGYPT'S KINGS

Ramses II., one of the most famous of the great line of Egyptian kings, was the third of the 19th Dynasty (1300 B. C.). He was a great warrior and builder. The Colossus found at Tanis is the largest ever made by the hand of man, and stands 125 feet high, including the pedestal.



WHERE DOES THE DAY BEGIN?

CONTINUED FROM PAGE 624

Now, said the Wise Man, the world is full of mysteries and of wonders, and there is no need for us to puzzle ourselves by making any that do not really exist. We could quite easily make all sorts of puzzles about time and the way in which it is reckoned; but we must understand that these puzzles are not *real*, but are made entirely by ourselves—not by Nature.

The real fact is quite simple. The sun goes on shining *all the time*, you know—it is well to remember that "the sun is always shining somewhere"—and the earth is spinning all the time. So the sun is always seeming to rise somewhere, because at some place or other the earth is just spinning round, so as to face it, and the sun is always seeming to set somewhere, because at some place or other the earth is just spinning away from the sun. That is simple.

And, of course, whatever we call *now*, whether we call it six o'clock or twelve o'clock, *this now is now everywhere*. The present moment *is* the present moment here and on the farthest star. Only when just opposite the sun *we* call that midday, whereas the people on the other side of the world are then away from the sun, and call it midnight; but this present moment of ours is their present, too, of course, and the difference is merely a difference of name to indicate that *now* we are opposite the sun, and they are away from it. It would be foolish for us to make a mystery where none *really* exists, or to forget that *now* must be *now* everywhere.

But, simply because the earth goes on spinning, and the sun is always shining, the day is dawning somewhere always, and *really*, therefore, the answer to the question, "Where does the day begin?" is that the day is always beginning somewhere.

ARE THERE TWO DAYS AT ONCE?

Since people live in different parts of the world, what we call night (when it is our night) will be someone else's day, and our midnight, when a new day begins for us, as we reckon, will not be the midnight of other people in other parts of the world, so that what we *call* Monday they may *call* Tuesday, yet we and they are both talking about the same moment!

Now, it would be very inconvenient if all the different parts of the world east or west of each other persisted in talking of time as if they were the only people on the earth, and as if their midnight must be everybody's midnight—which it is not. So we reckon by two sorts of time. One is *local* time—the time reckoned by what is happening at the particular place whose time it is; the other is *standard* time, which we agree

upon, so that we can catch trains, and so on, just as if midnight in one place were midnight everywhere. Up till 1883 people often missed trains through this difficulty, and then "standard time" was invented.

WHERE DOES THE HOUR CHANGE?

Now let us see what this means. You understand that, as the earth spins toward the east, the only places at which the dawn comes at the same minute are those on a line drawn from the North to the South Pole. When one of our readers in Boston is up and eating his breakfast, it is still dark in Denver, since the earth has not turned far enough for the rays of the sun to reach that city. When the schools in New York are dismissing for luncheon at noon, the pupils in San Francisco are just going into school.

In order to prevent confusion, lines have been drawn across the American Continent from North to South, dividing the country into five "time belts" or zones. A small part of Eastern Canada has Atlantic Time. Then come Eastern, Central, Mountain and Pacific. In each zone the clock is an hour slower than in the one before. When it is ten o'clock in Halifax, it is nine o'clock in Boston, eight in Chicago, seven in Denver, and six in Vancouver.

If one kept on travelling westward, the sun would rise later and later every day, and when he had gotten all the way around the world, he would have lost a whole day. If he travelled eastward the condition would be reversed.

WHERE DID THE ALPHABET COME FROM?

No one really knows all about where the alphabet came from, because it grew very slowly, like children and like every other good thing in the world. But we know quite well that no clever man sat down and made the alphabet, and we know quite well, too, that the alphabet began as pictures.

Just as a child reads or takes things in by pictures long before it can read letters, so men used to read and write by pictures; and then these pictures were gradually made simpler and simpler, until at last they could be used in every and any way, as our letters can. We know for certain that the letter O was at first the picture of an eye, and that gradually men made the picture simpler and simpler, until at last they just drew an O. We know for certain also that the letter I was once the picture of a man standing, and many people think that the letter A was once the picture of a house; and very likely a capital A may have been at first the picture of a pyramid.

Ages and ages ago in Egypt men used both kinds of writing. The priests used the oldest kind, which were the pictures. This was called the sacred writing. But the ordinary people used a different and newer kind of writing, in which the pictures were turned into letters. Not very many years ago, men tried in vain to read the old sacred picture writing of the Egyptians, but they could not. Then they found the wonderful stone Rosetta, and that this had written upon it the same thing three times—once in the pictures and once in the letters, and also once in other letters, and so men got the key to the picture-writing, and now it can be read easily.

WHY DO WE HAVE NAMES?

Well, plainly, said the Wise Man, we have names for the same reason that everything has a name. If we did not have names, we should have to have numbers, like the numbers on motor-cars, which serve just the same purpose. Now, there are names which have meanings, and there are names which have none, and it is always well to know how much and how little a name means. There is something which we call electricity, which means really that it has something to do with amber, for when you rub amber you get electricity, but people sometimes speak as if the name explained electricity, or as if it explained something else to say that it was electricity. That is because they do not know how little the name means. We might just as well call electricity X—which is the name in what is called algebra for something we do not know.

One thing you ought to know, however, is the meaning of your own name. If your name is Theodore, for instance, you ought to know that that means the gift of God. Many of our names have meanings, which you can sometimes find in the Bible. The Bible tells you, for instance, what Peter means, but you must find out for yourself where it is.

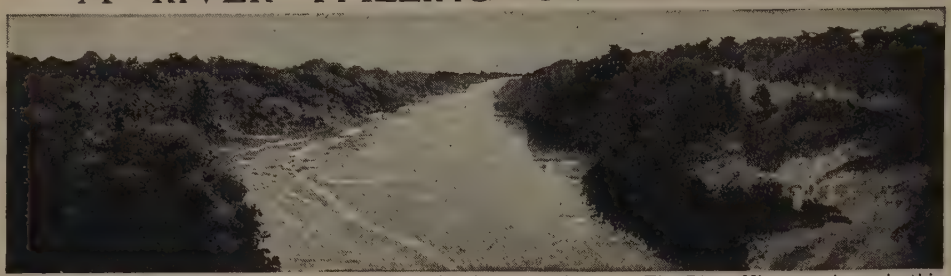
WHY DOES THE FOUNTAIN PLAY?

The puzzle about the fountain is that the water comes upwards, though we know that water always tries to fall; it falls because the earth pulls it. Now, something must be pushing the water up more than the earth is pulling it down, and the question is what? The answer is that the water in the fountain is being pressed upon at the end which we cannot see by the air, which is really very heavy; and the fountain is so made that the air pushes one end of the water and makes the other end spout up. If this sounds puzzling, you have only to look at a syphon of soda-water, which is a fountain. If the spout turned upwards instead of downwards, it would be just the same as any other fountain. The air, or gas, inside the syphon presses hard on the soda-water below it, and directly it gets a chance the soda-water rushes up the tube in the middle of the bottle and out at the spout. When you make the soda-water run, you do just the same as the gardener when he makes the fountain play.

WHAT IS IT THAT MAKES THE FOUNTAIN PLAY?

A fountain plays because the water comes to it from a great height, or because the heavy pressure of the air upon it pushes it. In the fountain shown in this picture, the water falls from the reservoir through the water-course, so that the water runs until it finds the air again, when the pressure is released.

A RIVER FALLING OVER A CLIFF

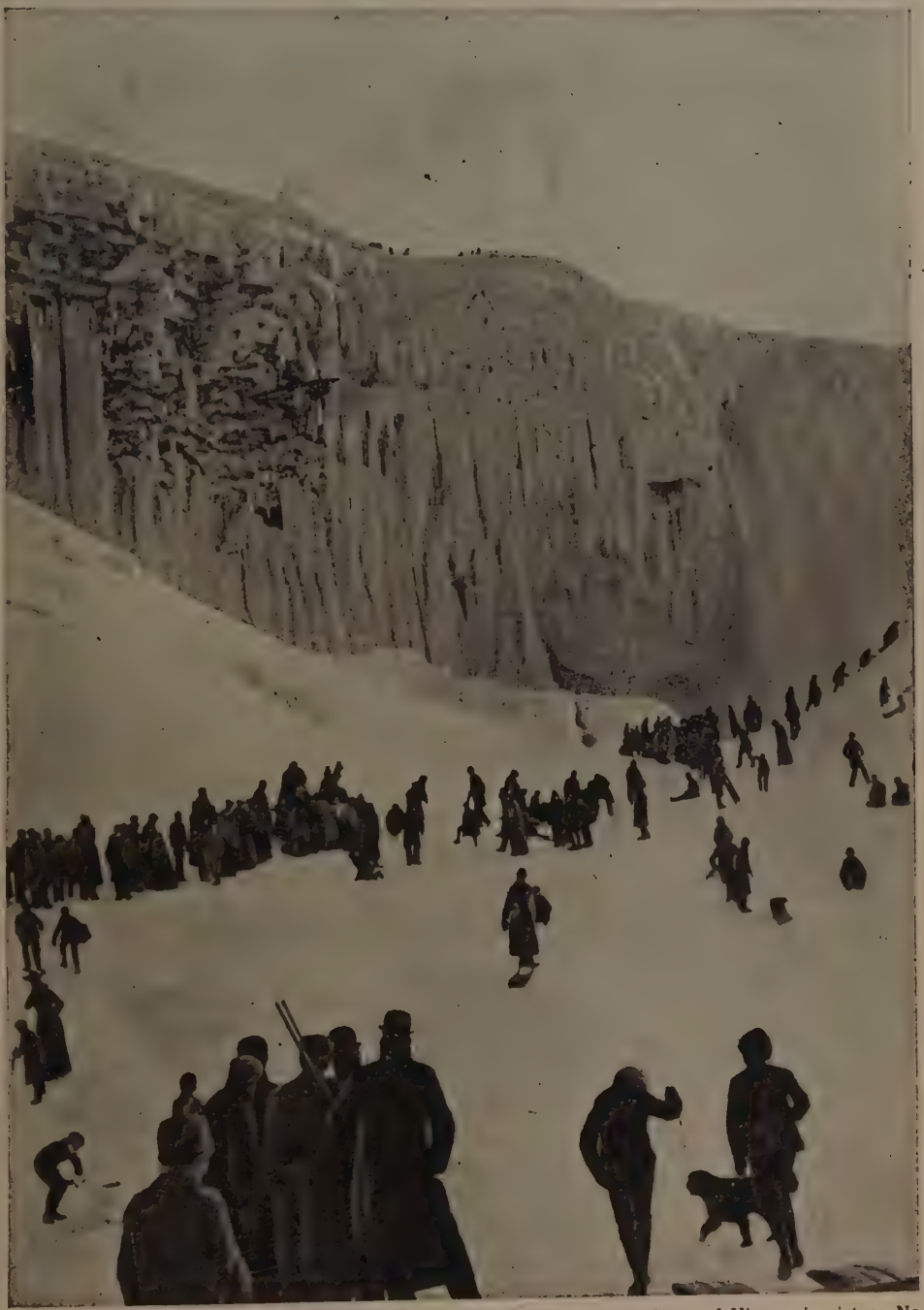


One of the greatest falls of water in the world is that at Niagara. The River Niagara, shown in this picture, flows rapidly along between Canada and the United States until it comes to Goat Island, which divides it into two parts. Then the river rushes over two huge cliffs. Here we see the river before the fall.

Here we see Niagara river taking a plunge of 158 feet. No one who has not seen this marvellous waterfall can have any idea of what it is like. The water roars like thunder as it plunges down the cliff, great clouds of spray are thrown into the air, and when the sun shines a beautiful rainbow is seen across the sparkling water.

This picture shows Niagara below the falls. There are two of these great falls side by side, called the American and the Horseshoe Falls. As soon as the water has plunged over them it rushes through a narrow gorge, turning sharply to one side, and the two streams form the Whirlpool Rapids, looking like a storm at sea.

JACK FROST STOPS THE FALL OF NIAGARA



This is one of the most wonderful things ever done by Jack Frost. It is a picture of Niagara in winter. No man's hand, no machine ever made by man's hand, could stop the mighty rush of Niagara over the cliffs; but winter does it, and silently ends the roar of the waters. When winter comes the cold in America is so severe that parts of the great Niagara Falls are frozen over, and then the sight is one of the most beautiful in the world. Part of the frozen falls is shown in this photograph. Imagine enormous icicles, far thicker and taller than the pillars in any cathedral, all sparkling like diamonds in the sunshine. The frozen spray covers all the rocks and trees near the falls with wonderful hoarfrost, looking like beautiful moss and ferns of glittering white.

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HOW DOES A COAT KEEP US WARM?

Now, this is a very good, sensible question, said the Wise Man, for you have used exactly the right words in asking it; and this is just a case where, because a question is properly asked, it can be easily answered. If you had said, "How does a coat *make* us warm?" I should have had to tell you that a coat does not *make* us warm, but that all any coat can do is to *keep* us warm. Except when the sun is actually shining upon us, or when we are huddling over a fire, we make all our warmth for ourselves. There is no warmth in a coat or in any article of clothing. So, of course, clothing cannot make us warm—unless, indeed, we hold it in front of the fire until it is hot, and then put it on. Indeed, when you come to think of it, we make our clothes warm. Our clothes often feel quite cold when we put them on, but when we take them off they are warm, and they have got the warmth from our bodies.

HOW DO CLOTHES KEEP IN OUR WARMTH?

Our clothes keep in the warmth which we make for ourselves simply because they are made of stuff which will not let warmth out. All sorts of things can keep all sorts of other things from running about. When you put water in a tumbler, the water cannot run through the glass; it is kept in. When you pull a shade down over the window, the light is kept out; when you put suitable clothing on anything, its heat cannot get through it, and so it keeps warm. The reason why we put a tea-cosy on a teapot is exactly the same as the reason why we put clothes on ourselves. The clothes or the tea-cosy prevent the warmth from getting out, just as the shade prevents the light from getting in, and just as the glass of the tumbler prevents the water from getting out. This works both ways; and sometimes people put clothes on to keep heat from getting into them, as when you put on a straw hat on a sunny day.

Clothing is only something that warmth cannot get through. Now, warmth is always trying to run from warm places to cold places—from our bodies to the outside air; or from the outside air into something else. And, in either case, if you want to keep things as they are, if you want to keep warm things warm and cold things cold, you must put a barrier between warm and cold, so that the warmth cannot get through.

HOW DO CLOTHES KEEP ICE COLD?

That is a good question; the best way to understand how clothes keep us warm is to learn how to keep ice cold. Well, now, if clothing is simply something that keeps back heat, as a blind keeps back light, what would happen if we put some clothing on the ice? If we choose nice warm clothing—which simply means that it keeps us warm—ought it not to keep the heat from outside from getting into the ice?

Now, that is exactly what happens. If we take the warmest kind of clothing that we can think of, which is flannel, and if we wrap the ice up in flannel, we keep the ice cool, and prevent it from melting. Now, do you not think that is rather funny? When we want to keep ourselves warm we put on warm clothing, as we call it; and when we want to keep ice cold we put warm clothing on it. Would you not almost have thought that the clothing which made us warm would make the ice warm too, and so make it melt? Well, so it would if the clothing were really warm, like a hot bottle. But then, you see, it is not really warm; there is no warmth in it at all.

WHY ARE SOME CLOTHES WARMER THAN OTHERS?

You know what a thermometer is. It is something that measures how hot things are. Now, if you take a piece of flannel and a piece of linen that have both been in the same room for some time, and if with a thermometer you try to find out how hot they are, you find that they are both just at the same level of hotness. But on a cold day you would rather put on flannel than linen, because, as we say, the flannel is so much warmer. Yet, according to the thermometer, the flannel and the linen are each just as warm as the other.

What is the meaning of this puzzle? It is simply that some things are better barriers to heat, and keep heat back better, than other things. Some things will let it through quickly, some slowly.

WHY ARE SOME THINGS COLDER THAN OTHERS?

In an ordinary room without a fire all the different things are just as warm as each other, because, if it has time enough, the warmth will spread itself

equally over everything about it, running from anything that started hotter to anything that started cooler.

Yet if you go and touch several of the things in the room, one after the other, you find that they feel very different as you touch them. A thing like the fender will feel cold; the carpet will feel warm; wood would feel colder than the carpet, but warmer than the fender. Now, that is simply because these things differ in their power of keeping heat from running through them, just as flannel and linen differ. The brass of the fender lets heat run through it very quickly, but the carpet lets heat run through it very slowly, and so we say that the fender feels cold and the carpet feels warm, just as a linen sheet feels chilly when we get into bed, whilst a woollen blanket feels warm. If a thing carries heat quickly away from our finger, it makes our finger cold, and we say that the thing is cold; and we call another thing warm in comparison with it, if that other thing, like flannel, only carries away the heat from our finger very slowly.

HOW DOES A MACKINTOSH KEEP US DRY?

A mackintosh keeps us dry because it is made of a material which water cannot get through. Our ordinary clothes are full of tiny little holes, or pores, and so we call them porous. The water runs into these little holes, and so will make our clothes wet, just exactly as it runs into a sponge, which is also full of holes, or pores—only these are so big that we can see them. But if you take a thing like a piece of india-rubber, you find that water cannot get through it because there are no holes in it to let the water through; or you can take a piece of ordinary cloth, which is porous, like a sponge, and then, if you melt indiarubber and put the cloth in it, the rubber will fill up the holes in the cloth, making it waterproof.

The name of the man who found out how to do this was Mr. Mac Intosh, and that is why many kinds of waterproof coats are called mackintoshes now. For no particular reason we have put a "k" into the word. Now, there is another kind of material which also keeps water out, or, at least, in its natural state it keeps water *out*, but we take it and cut it up, and put it into bottles and use it to keep water and medicine *in*. There is a special kind of tree which makes this *cork*, but really all trees have a layer of cork inside the bark, and this makes them waterproof. Indiarubber is also got from trees.

And so, when we wear a mackintosh, we first of all take something from the coat of a sheep to make woollen cloth, and then we take something from the world of plants in order to make the cloth waterproof. If we wore the sheepskin with the wool in it, that would be waterproof, for the skin of a sheep is waterproof, just as our own skin is waterproof, though you may never have thought of that before. What in the world would happen to us when we took a bath if our skins were not waterproof?

WHY DOES A WHEEL GO ROUND?

A wheel goes round for the same reason as the earth or a top. Nothing goes round or moves of itself, but it always requires some force from somewhere to move it. If it is a bicycle wheel that goes round, it is the force of the muscles of your leg that makes it do so, or if it is a carriage wheel, the force is produced in the muscles of the horse; but if once anything is started spinning—as the earth, or a top, or a wheel—it will go on spinning until something stops it. In the case of your bicycle, when you stop pedalling, the wheels gradually move more slowly if you are going on the level, because the resistance of the air slows you down, exactly as the resistance of the water slows a boat down when you stop rowing. But you know that if you are going downhill you will not stop, but may actually get faster and faster. This is because, though the air is resisting your bicycle, the attractive power of the earth, which we call gravitation, is pulling on the bicycle, and it pulls more strongly than the air holds you back.

WHY DOES A WHEEL STOP?

Well, I have already given you one of the reasons why a wheel stops when it has once been started, and that is the resistance of the air. But wheels also stop through another kind of resistance, which is called *friction*. The wheel of a bicycle, for instance, travels round and round on something in the centre of it, which we call the axle, and as the wheel rubs against the axle it is made to go slower. If you put your finger on your

arm and rub it along your skin and press a little, you can see how you are opposed by friction; but if you put some oil on the tip of your finger first, the finger will slide along your arm quite easily, because the oil lessens the friction.

For exactly the same reason you have to oil the bearings of a bicycle. Perhaps you know that a special way has been found in which to lessen the friction of a bicycle, so that, after you stop pedalling, the wheels will go on running much further than they otherwise would. A number of tiny steel balls are put between the axle and the wheel, so that the wheel really runs on these little balls. This is what is called "ball bearings," and every bicycle has them, both for the wheels and for the pedals.

COULD A TOP SPIN FOR EVER?

Friction also helps to stop a top, but if you spin the top on a perfectly smooth plate, so that there is very little friction, it will spin much longer; and if you could spin the top on a smooth plate inside something from which you had taken away all the air, it would not be difficult to get the top to spin for hours, because *things which have once started moving go on moving until something stops them.* If the top could be spun where there is no air at all, and nothing happened to hinder the spinning, the top would certainly go on for ever. The earth is like a great wheel or top spinning round and round in space, but, as space is almost empty, and as the earth's air is part of the earth and goes round with it, and as the earth is not spinning on anything, as a top spins on a plate, the earth scarcely slows down at all throughout the ages.

HOW FAST CAN A WHEEL GO ROUND?

Now, you might think that if you applied sufficient force to a wheel—say, the wheel of some kind of engine that was driving something—it would go round faster and faster and faster, and there need be no limit at all to the speed at which it went round. But that is not true, and sometimes when men forget it, and make wheels go round too fast, terrible accidents happen. If you take an umbrella that has been out in the rain, and twirl it round very gently and slowly, the drops of rain will hold on to the umbrella tight enough to go round with it, but directly you spin the umbrella a little faster, the drops of rain, as you know, fly off from the umbrella. As long as the umbrella went round slowly, the force of sticking, or *cohesion*, as it is called, was sufficient to make the drops stick to the umbrella, but when the umbrella went round a little faster, the force of cohesion could not keep the drops sticking to the umbrella, and so off they flow. But now, after all, it is nothing but cohesion that makes the parts of a wheel stick to each other, and if the wheel went round quickly enough, this cohesion would not be strong enough to hold the wheel together, any more than it is strong enough to hold the drops to the umbrella if spun quickly.

COULD A WHEEL FLY OFF AN ENGINE?

Sometimes when an engine has been set running too quickly, a great wheel, perhaps made of heavy steel, has flown to pieces. These pieces have gone flying out just as the drops do from a spun umbrella, and sometimes these have done terrible damage. This applies to everything that spins—the earth, or a wheel, or a top. There is a limit to the speed at which it can spin without flying to pieces, because there is a limit to the power of cohesion, or holding together, and directly that limit is passed, the pieces of the wheel, or the top, or the earth—if the earth were set spinning too quickly—must fly away. For everything that is moving tries to move in a straight line, and the reason why a wheel can spin at all is that the parts of it move in circles instead of in straight lines, because they are held by cohesion; but if cohesion is not strong enough, all parts of the wheel, like the drops on the umbrella, will start moving in straight lines instead of in circles, and the wheel will fly to pieces.

WHY DOES A STICK FLOAT?

We must remember that the earth is all the time trying to pull everything to itself; it pulls us, it pulls the air, it pulls a balloon, it pulls the moon. Now, the heavier the thing is the more it is pulled, and water is heavier than a stick. This does not mean that all the water in a pond is heavier than a stick, because, of course, we know that. But it means that, if you had a cup and filled it with water, and had another cup the same size and filled it with stick, the cup with the water would be heavier—that is to say, in a fixed amount of space you can pack a greater weight of water than of wood. That is

what we mean when we say that the water is heavier than the stick.

Of course, a pound of water is the same as a pound of stick, and you do not need me to answer the question—Which is the heavier, a pound of feathers or a pound of lead? They both weigh the same, only the lead takes up less room, and so we say that lead is heavier than feathers, though a pound of lead weighs the same as a pound of feathers. The proper name for a heavy thing is *dense*, and, whenever it is possible, the earth always pulls the denser things furthest down, and the less dense things float on the top of it. That is why the stick floats; that is why the cold air is found nearest the floor, because cold air is heavier, or denser, than warm air, and the warm air floats on the top of it as the stick floats on water.

WHY WOOD FLOATS AND WHY IRON SINKS

Wood floats because it is full of tiny quantities of air, and so is lighter, or less dense, than the water. A stone, or a lump of iron, has no air in it; it is denser than the water, and therefore it sinks. An iron ship floats because it is hollow and full of air, so that *as a whole* it is lighter than the water. If we filled it up solid with iron or stone, or if it cracked and so let the air escape from it and the water come in, it would sink, as shown in the second of these pictures.

WHY AN IRON SHIP FLOATS

WHY DOES A STONE SINK?

The last answer really explains this question. The stone sinks because it is heavier, or denser, than an amount of water occupying the same amount of room; and the water floats on top of the stone just as the stick floats on top of the water. It all depends upon the great law of the pull, or attraction, of the earth for everything outside it, and the heavier the thing is, the stronger the pull. A lump of iron sinks in just the same way.

WHY DOES AN IRON SHIP FLOAT?

Men used to think that a ship had to be made of wood in order to float, because wood floats and iron sinks. But now all big ships are built of iron. Why do they not sink like a stone or an anvil? It is because of their shape. When they are hollowed out the whole space they occupy is filled with air, which makes the ship, as a whole, lighter than water, and so it floats. You can even put things into it, but the more you put in, the deeper your ship rides in the water. You can store iron in it, but if you packed it full of iron, or anything heavier than water, it would sink.

One brave man fought for years for the lives of sailors, and at last got a law made that a line should be painted outside the hulls of ships, and that the ships must not be packed so heavily as to sink that line below the surface of the water. Like everyone who does anything worth doing, he was laughed at, but his name will always be remembered, and that line, which protects sailors, will always be called Plimsoll's line, in his memory.

The next questions begin on page 773.

THE DISGUISED PRINCESS RESCUING THE LADY AMORET

Princess Britomart, disguised as a knight, is here rescuing the Lady Amoret, after slaying the monster, in fulfilment of a vow given by her to her absent lover. The story is told in the following pages.

STORIES FROM THE "FAERIE QUEENE"

AN allegory is a story in which the characters represent good or bad qualities. The "Faerie Queene" is a great poetic allegory by Edmund Spenser, first printed in the year 1590. It takes us to Fairyland at the time of the annual festival, lasting twelve days, and on each of these days a brave knight has to go forth on some adventure to fight against evils. Gloriana, the Fairy Queen, stands for Glory; Prince Arthur for the Spirit of Chivalry, St. George for Christianity, Sir Guyon for Temperance, Britomart for True Love, Sir Calidore for Courtesy, and so forth. The deeds of these and many other champions in overcoming the forces of evil are all told in the "Faerie Queene," which is the old way of spelling "Fairy Queen." Only six books of the great poem exist; the other six, in which the twelve days of adventure were completed, were lost by the poet's servant.

UNA AND THE RED CROSS KNIGHT

And how the Knight set free the King & Queen

CONTINUED FROM 636

ON the first day of the festival of the Fairy Queen there presented himself a tall, clownish young man, who, falling before Gloriana, desired a boon—as the custom then was—which, while the feast lasted, she might not refuse. This boon was that to him might befall an adventure during the festival. His prayer being granted, he seated himself upon the floor, being thought unfitted by his rank for a better place.

Soon afterward there entered a fair lady, named Una, who was in mourning. She was riding on a white ass, with a dwarf behind her, leading a war-like steed that bore the arms of a knight. Falling before the Queen, this lady complained that her father and mother, an ancient King and Queen, had been shut up in a brazen castle by a huge dragon. Would the Queen, she prayed, send one of her knights to liberate her parents from the dragon?

Hearing her request, the tall, clownish young man begged that he might be entrusted with the adventure. All wondered at his temerity, and none more than the Fairy Queen and Una. But, the youth urging his suit, the lady said that unless the armour which she had brought could be worn by him, he could not succeed. Thereupon, the armour being put upon him, "he seemed the goodliest man in all that company." He was now given the rank of a knight, and, mounting the strange horse which the lady had brought with her, he set forth with her as the Red Cross Knight, accompanied by the dwarf.

For a time the beauty of the country through which they passed drew their thoughts away from the perils that beset their enterprise. But ere long a great storm arose.

Enforced to seek some shelter nigh at hand,
A shady grove not far away they spied,
That promised aid the tempest to withstand;
Whose lofty trees, all clad in summer's pride,
Did spread so broad, that heaven's light did hide,
Not piercable with power of any star;
And all within were paths and alleys wide,
With footing worn, and leading inward far,
Fair harbour to them seemed, so soon they entered are.

And forth they pass, with pleasure forward led,
Joying to hear the birds' sweet harmony,
Which, therein shrouded from the tempest dread,
Seemed in their song to scorn the cruel sky.

Led on by delight, they did not notice, until the storm had passed and they wished to retrace their footsteps, that they had lost their way in Wandering Wood. Here was the den of Error, a fearsome monster, half woman, half snake, that dwelt in a darksome cave in the thickest part of the wood.

In no way daunted by the warnings of Una and her dwarf, the Red Cross Knight sought out this monster, which,

after a terrible encounter, he killed. Then, proceeding on their journey, the travellers found their way out of the wood. On their way they met a venerable-looking old man, dressed like a hermit, who greeted them with fair words, bidding the Knight take rest with the westering sun. "So with that godly father to his home they went."

A little lowly Hermitage it was,
Down in a dale, hard by the forest's side,
Far from resort of people that did pass
In travel to and fro.

THE WICKED MAGICIAN MISLEADS THE RED CROSS KNIGHT

They passed the evening with fair discourse. Drooping night creeping on, their host showed them their sleeping-place. While they slept the seeming hermit, who was none other than the wicked magician Archimago, caused the Knight to dream that his lady, Una, was false. Believing his dream to be true, the Knight fared forth in anger from the Hermitage, leaving Una behind.

When Una arose she looked in vain for her Knight. She began to wail and weep; but

After him she rode, with so much speed
As her slow beast could make; but all in vain,
For him so far had borne his light-foot steed,
Pricked with wrath and fiery fierce disdain,
That him to follow was but fruitless pain;
Yet she her weary limbs would never rest,
But every hill and dale, each wood and plain,
Did search, sore grieved in her gentle breast,
He so ungently left her, whom she loved best.

One day, nigh weary of the irksome way, Una alighted from her slow beast. Resting in a secret shade, she was suddenly seen by a fierce lion. Eager for his prey, the king of the forest was rushing upon Una, when he was stopped by the sight of her great beauty, and, instead of attacking her, kissed her wearied feet, licked her lily hands with fawning tongue, and became her devoted attendant and protector. After undergoing many hardships and dangers, Una at last met Prince Arthur and was safe.

PRINCE ARTHUR KILLS THE GIANT AND THE TRAVELLERS MEET A NEW PERIL

When he left the enchanted Hermitage the Red Cross Knight again encountered deception in the form of Duessa, a daughter of Archimago. Duessa, who was disguised, led the Knight to the House of Pride and persuaded him to drink of the water of an enchanted spring, with the result that he fell an easy prey to the giant Orgoglio, who cast him into a noisome dungeon. From this he was rescued by Prince Arthur, who killed the giant, exposed the falsity of Duessa, the giant's accomplice, and reunited the Knight and Una.

Starting forth once more, these two came to the Cave of Despair, where a new kind of peril was met, to which the Knight all but yielded. Seeing all around the ruin wrought by Despair, the Knight threatened him with death, but so artfully did the villain speak in praise of death that, after trying to argue with him, the Knight yielded to his view, and taking from his hand a dagger, was about to plunge it into his own breast, when Una snatched it from him and, casting it upon the ground, said:

"Fie, fie, faint-hearted Knight!
What meanest thou by this reproachful strife?
Is this the battle which thou vauntest to fight
With that fire-mouthed Dragon, horrible and bright?

"Come, come away, frail, feeble, fleshly wight,
Nor let vain words bewitch thy manly heart,
Nor evil thoughts dismay thy constant spright.
In heavenly mercies hast thou not a part?
Why shouldst thou then despair that chosen art?"

UNA TAKES THE KNIGHT TO THE HOUSE OF HOLINESS

Taking heart at these words, the Knight rose up, and was taken by Una to the House of Holiness, where Faith, Hope, and Charity dwelt. Here he was taught repentance; here he saw a vision of the Holy City prepared for the chosen of God; and here he gained strength for his task.

Once more in Una's company the Knight set forth for the brazen tower wherein her parents were imprisoned for fear of the dragon. Encountering this fearful beast, the Knight fought with him for two days, and, coming again to the fight, gained the victory on the third day.

Thus were the aged King and Queen liberated; and so it came to pass that with great rejoicing Una and the Red Cross Knight—who was none other than St. George—were united in happy wedlock.

SIR GUYON, CHAMPION OF TEMPERANCE
And how he overcame the Enchantress

THE wicked magician Archimago, having learnt that the Red Cross Knight had returned, as he was in duty bound, to the Court of the Fairy Queen, invented another scheme by which the hero might be brought to ruin. Accordingly, when he met Sir Guyon, the enchanter told a painful tale of how a beautiful lady, meaning Una, had been cruelly wronged by the Knight of the Red Cross.

Sir Guyon, the Champion of Temperance, thereupon set out to punish the recreant knight, but when they met and Sir Guyon was about to run upon him with his spear, he recognised his fellow-adventurer; so the two champions exchanged courtesies and parted.

Now, it was Sir Guyon's task to seek out and destroy the bower of Acrasia, whose wiles had brought so much ruin to noble men, and when he was pursuing his journey, he heard from a neighbouring thicket the voice of a woman crying. Alighting from his steed, he found Amavia dying by the side of her husband, Sir Mordant, and with her little child on her knees. Sir Mordant was one of the victims of the cruel Acrasia.

SIR GUYON VISITS THE CASTLE OF THE LADY MEDINA

After they had buried Sir Mordant and Amavia, Sir Guyon and the Palmer, a wandering pilgrim who accompanied him, found that Sir Guyon's steed and spear had been stolen by a boastful coward named Braggadochio. Taking the infant with them, the two travellers made their way to the castle of the Lady Medina or Golden Mean, who lived with her sisters Elissa (Too Little) and Perissa (Too Much).

The lovers of Elissa and Perissa were at enmity, and though both, when they saw Sir Guyon, went forth to attack him, before they could reach him they quarrelled together. Medina came out and succeeded in making peace, and all went into the Castle, where they sat down to a hospitable board, while Sir Guyon told of the adventure on which he was bound. Leaving the child to the care of Medina, Sir Guyon proceeded on his way on foot. In the meantime, Braggadochio, flourishing the stolen spear and mounted on Sir Guyon's steed, had by his show of false courage pressed a poor idler into his service. Thus armed and attended, he was met by Archimago, who, deceived as to Braggadochio's character, accused Sir Guyon and the Red Cross Knight of wronging him.

THE COWARDICE OF THE BOASTFUL BRAGGADOCHIO

Braggadochio boasted of the punishment he would wreak upon the heads of these knights. When advised that he had better be armed with a sword against such enemies, he declared that, since he had killed seven knights with such a weapon, he had sworn never to bear a sword again, unless it should be the sword of the very bravest of men.

Promising to secure for him the sword of Prince Arthur on the morrow, Archimago vanished so suddenly that the coward Braggadochio and his equally alarmed attendant fled in haste, and without turning their eyes, into a thick forest. Here the sound of a horn caused Braggadochio to fall from his horse, and, like the coward that he was, he crept into a thicket. His attendant, Trompart, however, looking round, was amazed to see before him a beautiful huntress, Belphœbe, carrying in her hand a spear. While Belphœbe was asking of Trompart the course pursued by a hart she had wounded, she heard a noise in the thicket, and was advancing when Braggadochio crawled from his hiding-place. He was telling her a lying story, but, undeceived, she threatened him and disappeared, whereupon he once more mounted his horse, and with Trompart went on his way.

THE ENCOUNTER WITH A MADMAN AND HIS UGLY MOTHER

While this incident was happening Sir Guyon and the Palmer encountered the madman Furor, with his ugly mother, Occasion, whom the Knight overcame and bound, effecting at the same time the rescue of the youth Phedon, who, having been deceived by a false friend, had killed him, and then fallen into the hands of Furor.

The Palmer was telling Phedon of the folly of passion when there rushed out upon them Atin, brandishing two darts. Atin sought to make Sir Guyon fly by

telling him of his master, Pyrochles, who was on his way thither, and against whom none could stand. Atin, who had been sent to find Occasion, taunted Sir Guyon with fighting against an old woman, and hurled against the Knight one of his fearful darts. But as this glanced off his shield, Sir Guyon was unhurt.

SIR GUYON IS LULLED TO SLEEP ON THE ENCHANTED ISLE

Pyrochles then appeared, and rushed at Sir Guyon, who, at length having him at his mercy, gave him his life, upon the condition that he rendered faithful service to his conqueror. Pyrochles then asked the Knight to let him release Occasion and Furor. This prayer having been granted, Occasion turned upon both Sir Guyon and Pyrochles, and, while the tumult was proceeding, Atin hurried away to the bower of Acrasia to tell Pyrochles' brother Cymochles that his master was slain, and to urge him forth to vengeance.

Cymochles, spurring on his mission against Sir Guyon, came to the shores of Idle Lake, whereon he saw a little boat, in which sat a lady fresh and fair, by whose sweet voice he was enticed aboard, entertained with song and story, and taken to an enchanted isle.

Here he was lulled to sleep. Then the lady, whose name was Phaedria, and who was a servant of Acrasia, betook herself into her boat again, and rowed to the other side of Idle Lake. Here she was seen by Sir Guyon, who asked her to ferry him over the water. Phaedria readily responded, but when Sir Guyon stepped on board, she quickly shot the vessel away from land, so that the Palmer was left behind.

Arrived at the Island of Joy, Sir Guyon was attacked by the awakened Cymochles. Effecting a peace between the two, but unable to win Sir Guyon by her allurements, Phaedria took the Knight back to the other shore.

Resuming his journey, Sir Guyon came to the home of Mammon, the Money God, to whose temptations he might have succumbed but for the help of an angel. After three days of weary wandering in the underground realm of Mammon, Sir Guyon was found by the Palmer, lying in a swoon. Sir Guyon was still lying helpless, when Pyrochles and Cymochles appeared and disarmed him. But at this juncture Prince Arthur came on the scene, and, after a terrible encounter with the two Pagans, gained the victory and delivered Sir Guyon from his foes.

ACRASIA IS BOUND AND SENT CAPTIVE TO THE FAIRY QUEEN

Having recovered strength in the House of Temperance, Sir Guyon resumed his quest. Setting sail on the sea, steered by the Palmer, he safely passed the Gulf of Greediness, the Rock of Vile Reproach, the Wandering Islands, the Quicksand of Unthriftihead, and the Whirlpool of Decay, till he won the Bower of Bliss, Acrasia's home.

Here a new victim of the Queen of Base Pleasure was released by him, and, other victims who had been transformed by her into wild beasts having been restored to their natural forms, Acrasia was bound fast, and sent captive to the Fairy Queen.

THE FACE IN MERLIN'S MIRROR

The Lady Knight & how she found her True Love

BRITOMART, the golden-haired daughter of King Ryence of Wales, looking one day into a glassy globe that Merlin, the wizard, had made, saw therein the image of Sir Artegall, a brave Cornish knight, and fell in love with him. Finding it impossible to make Britomart forget her vision, her old nurse took her to Merlin's cave, both assuming a disguise for the purpose.

The magician then told them that it was Britomart's destiny to wed the noble Artegall, and to become the mother of a line of kings. Donning the armour of Angela, the Saxon Queen, and arming herself with a mighty spear, which she found in her father's chief church, Britomart set forth with her nurse in search of Sir Artegall. They encountered Prince Arthur and Sir Guyon, who had met with many adventures since their overthrow of Acrasia and her champions. Seeing one whom he took to be a strange knight approaching, Sir Guyon rode forward against Britomart.

He was, however, quickly overthrown by the enchanted spear. Worse might have befallen him, but that wise counsels prevailed at the instance of the Palmer, who accompanied Sir Guyon, and the party rode on in good fellowship.

They had not travelled far before they saw the fair Florimell, rushing by on a milk-white palfrey, pursued by a grisly forester. Prince Arthur rode after Florimell, and Arthur's squire, Timias, went after the forester.

Britomart, finding her companions did not return, pursued her way with her own aged attendant. Leaving the wood in which they were, they came upon a goodly castle, before which they saw a single knight withstanding the onslaught of six others, servants of Malecasta, the Lady of Delight, whose castle it was—Castle Joyous by name. The single knight was he of the Red Cross—St. George. He declared himself true to Una, whereas the others were championing Malecasta, whose object it was to make all strange knights enter her service or prove in combat that the lady they served was fairer than the Lady of Delight. Taking the side of the Red Cross Knight, Britomart overthrew four of his assailants. The other two submitting, all entered Castle Joyous.

BRITOMART AND THE RED CROSS KNIGHT FIGHT THEIR WAY FROM THE CASTLE

Here, after passing through a chamber in which every pillar was of gold, embossed with pearls and precious stones, Britomart was escorted to an inner room of even greater magnificence, where sat the Lady of Delight, who, struck by the appearance of Britomart, and believing her to be a man, fell in love with her. In the end, it was only by fighting that Britomart and the Red Cross Knight won their way from the castle.

Proceeding in company, the Knight told his companion of the prowess of Sir Artegall, and she in her turn told him her history. At length they came to a road where their ways parted, and they bade one another farewell. Coming to the sea, Britomart encountered Marinell, son of the sea-nymph Cymænt, who, because of a prophecy that he should be dismayed or killed by "a virgin strange and brave," had fled from woman's love. Marinell, being laid low by Britomart, was carried by his mother to her home beneath the waves.

While Marinell was being tended by his mother, Florimell, who had been seeking him, was flying from Prince Arthur and Sir Guyon with as much fear as she had fled from the grisly forester. Prince Arthur, learning Florimell's story from her squire, bethought him of his own faithful Timias; Timias, on his part, had come up with the forester at a ford, and, after a fierce encounter, had slain him and his two brothers.

FLORIMELL CAST INTO A DUNGEON AT THE BOTTOM OF THE SEA

Sorely wounded, he was found by Belphœbe, who, with her attendants, carried him to a fair pavilion in the forest, where she daily dressed his wounds and instilled into his mind a deeper devotion to beauty and purity.

Meanwhile, Florimell had taken shelter in a humble cottage. Here lived a witch, whose wicked son so affrighted Florimell that she fled before the dawn. Pursued by a monster called up by the witch, Florimell came to the sea, and, seeing a boat in which an old fisherman was sleeping, leapt into this vessel, and with the oar pushed it out to sea.

As the monster was wreaking vengeance upon Florimell's defenceless palfrey, it chanced that a knight, Sir Satyrane, came that way, and overthrew the monster, who, however, afterwards escaped to tell his tale to the witch. Then the witch made of snow a false Florimell, the real Florimell having been taken to the bottom of the sea by Proteus, and, as she refused to wed him, cast into a dungeon.

SIR ARTEGALL SEES THE FACE BEHIND THE HELMET

All this time Amoret, the twin-sister of Belphœbe and the beloved of Sir Scudamore, had been imprisoned by the enchanter Busirane. After a series of adventures Britomart succeeded in liberating Amoret, with whom she fared forth to find Sir Scudamore, Amoret believing that her deliverer was a man. But Scudamore, deceived by lying tales, believed his Amoret to be false, and pursued his quest of her with a sorrowing heart.

On his way he met Sir Artegall, and, these two encountering Britomart, Sir

Scudamore was unhorsed by the wonderful power of the enchanted spear. Sir Artegall going to Sir Scudamore's aid, the two fought long and valorously, when, Britomart's helmet being struck aside, Sir Artegall was so overcome by her beauty that his arm fell powerlessly at his side, and he surrendered.

When Sir Artegall's helmet was removed and Princess Britomart saw his face, she recognised it as the one she had seen in Merlin's mirror.

Thus it was that the two were betrothed, but before the marriage could take place Sir Artegall had to depart on another adventure. Sir Scudamore bewailed his lost Amoret, who had been lost in a desert. Here she was captured by a monster.

Saved first of all by Belphœbe, Amoret was finally rescued by Prince Arthur, and Arminell was wedded to Florimell, the ceremony taking place in Cymænt's home under the sea.

THE QUEST OF THE BLATANT BEAST

And how Sir Calidore led him through Fairyland

SIR Calidore's quest was the destruction of the Blatant Beast, Slander, which had attacked Sir Artegall. On his travels he fell in with a troop of shepherds, with whom he stayed for a time. Among their number was Pastorella. Pastorella was beloved of all the shepherds, but especially by Coridon.

Sir Calidore fell in love with the fair shepherdess, and sought by the exercise of knightly courtesy to win her regard. But she, unused as she was to the ways of courts, remained unmoved. Then the knight, doffing his armour, clad himself in shepherd's garb, and tended the sheep with her. Joining in the rural sports, he was challenged by the jealous Coridon to a wrestling bout. Coridon being defeated, Pastorella placed the oaken crown of victory upon Sir Calidore's head, but he, "who in courtesy did excel," gave it to Coridon.

By such acts as these, Sir Calidore won his way among the shepherds and eventually to Pastorella's favour. One day, as he ranged over the fields, forgetful of his mission against the Blatant Beast, he came upon "a place whose pleasance did appear to pass all others on the earth that were."

It was an hill, placed in an open plain,
That round about was bordered with a wood
Of matchless height, that seem'd th' earth to disdain;
In which all trees of honour stately stood,
And did all winter as in summer bud,
Spreading pavilions for the birds to bower,
Which in their lower branches sang aloud;
And in their tops the soaring hawk did tower,
Sitting like king of birds in majesty and power.

And at the foot thereof a gentle flood
His silver waves did softly tumble down,
Unmarred with raggy moss or filthy mud;
Nor might wild beasts, nor might the ruder clown,
Thereto approach; nor filth might therein drown;
But Nymphs and Fairies by the banks did sit
In the wood's shade which did the waters crown,
Keeping all noisome things away from it,
And to the water's fall tuning their accents fit.

In this beautiful spot Sir Calidore saw the Graces dance to the piping of poor Colin Clout. Going towards them, he was amazed to see them disappear. On another day, when Sir Calidore was with the hapless Coridon and Pastorella, a tiger rose from the wood. Coridon ran to the rescue of his love, but when he saw the beast fully, he was so alarmed that he fled. Sir Calidore slew the tiger with his shepherd's staff. Thus it was that the knight finally won the affection of Pastorella.

But his joy was turned to pain shortly afterwards, for the maiden was stolen by brigands. Taking up the pursuit, Sir Calidore effected her rescue, and bore her to the Castle of Belgard. Here she was discovered to be the long-lost daughter of the good Sir Bellamoure and his lady, Claribell. Sir Calidore, leaving Pastorella in safety with her parents, set out again to seek the Blatant Beast. He was successful so far, at least, that he captured the monster, muzzled him with iron bands, and, to the great joy of all, led him through all Fairyland. So muzzled did the beast long remain—

Until that (whether wicked fate so framed
Or fault of men), he broke his iron chain,
And got into the world at liberty again.

Since that time none has succeeded in subduing him.

The next stories of famous books begin on page 899

WHERE THE WORLD'S SUGAR COMES FROM

Here we see the different sources from which the world obtains its sugar. In the circle at the top a man in India is seen climbing a tree to get the juice of the date-palm, which holds sugar. The two pictures at the bottom show the scene in a Canadian maple forest during the season for collecting the maple-juice, and a scene by the fire at which the maple-juice is being boiled down. In the centre are the various kinds of sugar-cane which grow in hot countries, and at the bottom, on the left, are examples of beet, from which sugar is made. The leaves and the root of the beet are both shown. The long, thin sugar-cane in the centre is the common sugar-cane, which was at one time the only source of sugar.

In this picture we see a plantation with millions of beetroots growing for the manufacture of sugar

WHERE THE SUGAR COMES FROM

CONTINUED FROM 651

THE SUGAR BEET

THE history of civilisation might be written round the sugar-basin. We could hardly live without sugar, so important is it to us as a food and a luxury; yet not so very long ago sugar was scarcely ever seen in the homes of the poor. So recently as fifty years ago it was extremely expensive. But the sugar-growing industry has become one of the most important in the world, and to-day, though sugar sells for only one quarter the price that it did half a century ago, a greater quantity is grown than ever was known before.

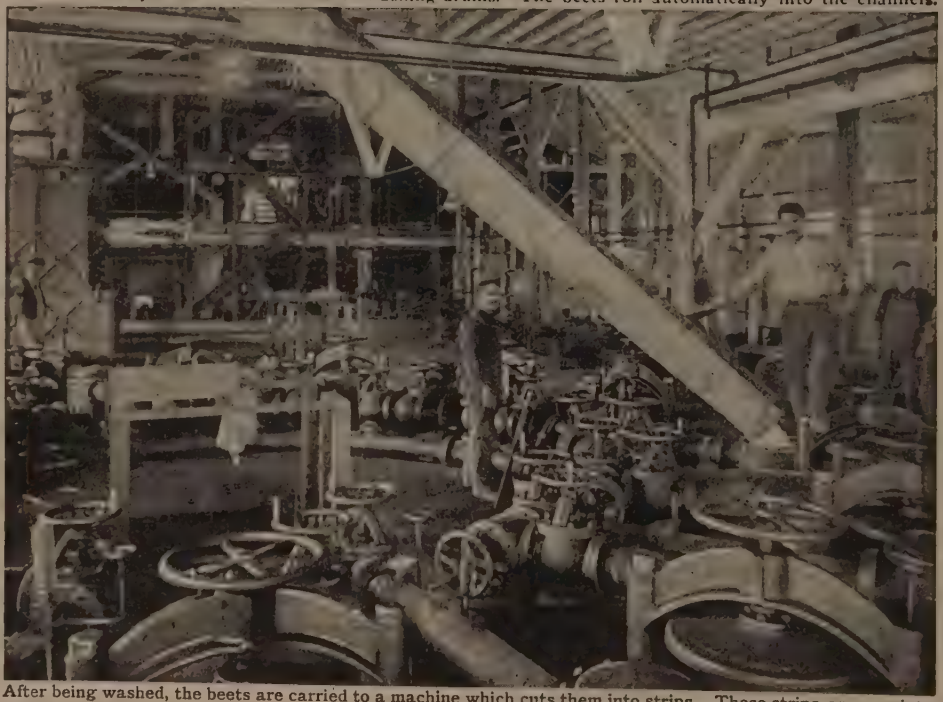
Sugar is to be found in the sap of many trees, especially in that of the maple. It is to be found in all fruits, and in the nectar of thousands of flowers, but it is from the sugar-cane and from the beetroot that we get our supplies for commerce.

For ages and ages the sugar-cane was the only source of supply, and it is wonderful to think that at one time all the sugar came from a single spot in the world. It would not be safe to say that it was in Bengal that the sugar-cane first grew, but it seems certain that in Bengal the process of extracting the sugar from the cane was first learned by man. Nearly 800 years before the birth of Christ the Chinese copied the valuable art from the people of Bengal, and then, 1,600 years later, the Persians began to cultivate the sugar-cane. It was the Persian doctors who first introduced the use of sugar into medicine—a fact for which all young patients will bless them. The Arabs, when they established colonies round about the Mediterranean, grew the cane there, and then the cane slowly made its way into Egypt.

Little by little it was carried to other warm countries of the world. Missionaries took it with them, and taught natives to cultivate it; travellers carried it to the lands which they explored; and eventually sugar-cane was grown throughout the West Indies, the East Indies, the warm lands of the southern United States, in many South American countries, and elsewhere. It was the discovery of the richness of the beetroot in sugar that lessened the importance of the sugar-cane. Beet is grown in enormous quantities in Europe. Russia, Germany, Austria, and the United States produce beet-sugar. Attempts have been made to create a trade on the same lines in Ireland, and perhaps success will come some day.

MILLIONS OF BEETS IN A SUGAR FACTORY

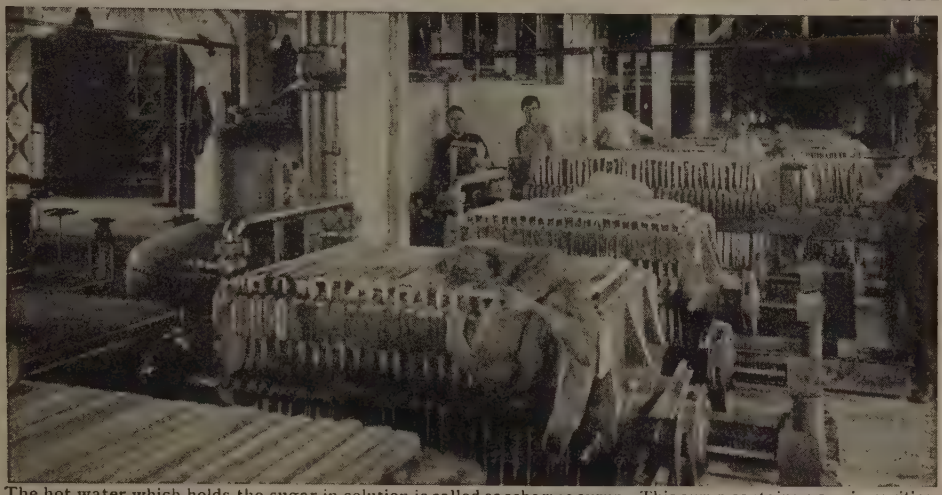
About eight million tons of sugar are produced every year from the beetroot, and of this quantity nearly a fifth is consumed in the United Kingdom. This shows millions of beets in the storage sheds, waiting to be carried by little water-channels to washing-drums. The beets roll automatically into the channels.



After being washed, the beets are carried to a machine which cuts them into strips. These strips are run into vessels, as shown here, where they are treated with hot water to extract the sugar. The vessels are arranged in a circle and connected by pipes, so that the water that washes out the sugar may flow through all the vessels.

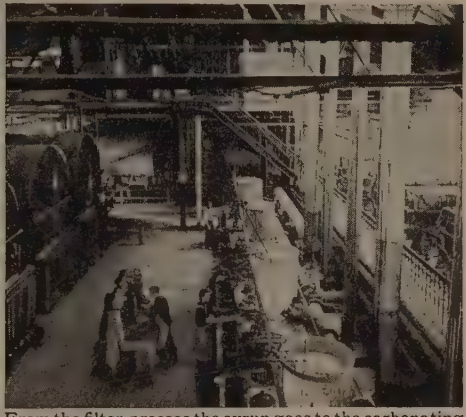
Upper picture copyright by Keystone View Co

THE BEETROOT BEING MADE INTO SUGAR

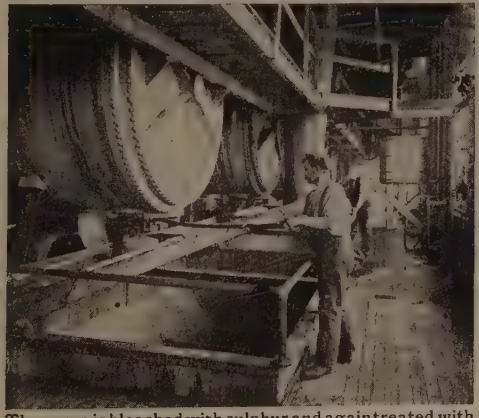


The hot water which holds the sugar in solution is called saccharine syrup. This syrup contains many impurities, mostly tiny particles of beetroot, and so it is passed into the settling-tank, where it remains until most of the impurities have sunk to the bottom. The clear syrup is then drawn off and treated in filter-presses like these.

Lime plays a very important part in the purifying of beet-juice. In this picture we see the kiln where limestone is burned to make it pure. The pure lime is quite white.



From the filter-presses the syrup goes to the carbonating tanks, shown here, where it is purified with a solution of lime. It is then charged with carbonic acid gas.



The syrup is bleached with sulphur and again treated with lime and carbonic acid. It is now concentrated by being heated in the huge crystallisers shown in this picture.

The mixture of molasses and sugar from the crystalliser is thrown into a centrifugal machine. This drives the molasses through holes, while the sugar-crystals remain.

Two middle and lower left-hand pictures copyright by Keystone View Co.

CATCHING THE JUICE OF THE MAPLE-TREE

In parts of the United States and Canada, making syrup and sugar from sap of the sugar-maple is an important industry. A hole is first bored in the trunk.

The sweet sap oozes from the tree, and little American boys are fond of inserting a small tube in the hole that has been bored and sucking the syrup from the tree.

The trees are tapped in time to catch the sap, which rises towards the end of the winter, and pails are hung on the trunks to receive the liquid. A single maple-tree yields from three to six pounds of sugar in a year.

HOW THE MAPLE-SUGAR IS MADE

It is a strange sight to see hundreds of trees with buckets hanging upon them, and to watch men going round in the morning collecting the sap that has dripped into the pails. From two to four holes are bored in each tree As soon as the tree begins to bud, the sap ceases to flow, and the sugar-collecting stops until the following spring.

To transform the sap into sugar is a very simple process, owing to the absence of impurities in the fluid. It is boiled in pans over a wood fire, in many cases in the open air. The scum is removed as it rises, and when the sugar crystallises it is allowed to cool. About 15,000 tons of maple-sugar is produced each year in America.

MAKING SUGAR FROM THE SUGAR-CANE

English people are the largest consumers of sugar in the world. There is nothing they would miss from their tables more than sugar. A great deal of sugar still comes from the sugar-cane, which is here being cut.

In this picture the sugar-cane that has been cut is being carted to the crushing-mills. This plantation is in the West Indies, and we see how oxen are used to draw the carts. Formerly all the sugar used came from the cane.

This is an Egyptian market, where the sugar-cane is being sold just as it was cut. When the cane is crushed, it yields a greyish-green fluid, which is purified by heat.

The cane is here being crushed. The fluid that comes will be purified, and then heated till the sugar-crystals form. The crystals are then separated from the liquid.

The next pictures of Familiar Things are on page 737

THE LOVE OF POETRY

OF course poetry is too big a subject for us to master in a short time; we can only hope just now to get into the way of liking to read and study it. But that is in itself a great thing to do, as youth is the time to form all good habits, and this is clearly a good one. We have already made some little progress towards becoming real lovers of poetry, and we are now to see why it is that we cannot read poetry in quite the same way as we read prose.

HOW TO READ POETRY

CONTINUED FROM PAGE 569

JUST as poetry has a different purpose from prose, is a different thing, in fact, so must we read it differently. We do not read prose, as a rule, in order to remember every word of every sentence. The reason is that in prose the *story* told by the words, the *thought* expressed, is what we wish to remember, rather than the *words* themselves.

With poetry it is not quite so, though even the story or the thought is still of first importance. No matter how strange, no matter how beautiful, merry or sad, the story the poet has to tell us, it must be told in words which are themselves so chosen and arranged that we can remember them and read them over again for their own charm.

Many phrases are full of poetry, by which we mean that the very words give wings to our imagination and seem to carry our thoughts into Wonderland. Tennyson, the great poet, when he was a little boy, used to be fond of repeating those simple words from one of our popular hymns, "Far, far away." They filled his mind with strange dreams of wonder, these simple little words.

If we read such a charming poem as "The Pied Piper of Hamelin," printed on pages **344–346,** we shall see what is meant by the value of words in poetry. This is only a tiny story that could all be told in a hundred words. The poet takes 303 lines to tell it; yet we would not wish it shorter. We are so pleased with the quaint words and merry phrases themselves. Here, then, is something quite different from ordinary prose, and we must read it differently.

The chief difference is not so much in the actual words, though they are very important, but in what we call the rhythm. This means the movement of the verses, the pauses, stops, the rise and fall of emphasis, the quickening or the slowing of the lines. If we look at the second verse of "The Pied Piper," we shall find we have to pause in the middle of the first line and at the end of it, and again at the end of the second and third lines; but only slightly at the end of the fourth, and not at all at the end of any of the other lines in the verse, except the last. This is how the poet contrives to quicken the movement of his story.

Think of the grand sounds that can be made by an orchestra. Well, the great poets can make us hear in imagination just such wonderful music.

We have, therefore, in reading poetry to *think* the sound of the verses, as well as the meaning of them, for the sound is part of the sense. If we altered the words we should lose something of the poet's meaning, just as we would destroy a painter's picture by putting a touch of yellow where he had put a touch of red. In prose we might alter words and phrases without injuring or destroying the writer's story.

Let us, then, try always, by giving to each word, each line and verse, its due sound and emphasis, to reproduce in our own minds the *rhythm* which the poet has intended to run through his poem like a thread of gold on which his thoughts are strung like beads. In a word, we must not *scamp* the reading of poetry, but read it slowly at first, with care, to get at the value of each phrase, its meaning, and then again more quickly to get the effect of the whole, and so many times over, for all good poetry is meant not merely to be read, but to be re-read.

THE LAMB

William Blake, the writer of this curiously beautiful little poem, was born in 1757 and died in 1827. He wrote many poems full of simple beauty, but he is admired chiefly on account of his weird poems about the spiritual world, for which he himself drew many strange pictures.

LITTLE lamb, who made thee ?
Dost thou know who made thee ?
Gave thee life, and bade thee feed
By the stream and o'er the mead ;
Gave thee clothing of delight,
Softest clothing, woolly, bright ;
Gave thee such a tender voice,
Making all the vales rejoice ?
Little lamb, who made thee ?
Dost thou know who made thee ?
Little lamb, I'll tell thee ;
Little lamb, I'll tell thee ;
He is callèd by thy name,
For He calls himself a lamb.
He is meek and He is mild,
He became a little child.
I a child, and thou a lamb,
We are callèd by His name.
Little lamb, God bless thee !
Little lamb, God bless thee !

LUCY

In reading poetry we should always try to be in the mood of the poet. If it is clear that he is serious, let us read him seriously. For it is very easy to make fun of serious thoughts if we care to do so. William Wordsworth was clearly serious in the following little poem, the first two verses of which are very fine ; but the simple pathos of the last verse is very easily turned into parody by writers who like to make fun of the serious poets.

SHE dwelt among the untrodden ways
Beside the springs of Dove,
A maid whom there were none to praise,
And very few to love :

A violet by a mossy stone
Half-hidden from the eye !—
Fair as a star, when only one
Is shining in the sky.

She lived unknown, and few could know
When Lucy ceased to be ;
But she is in her grave, and, oh !
The difference to me !

FAIRY SONG

There is nothing so difficult to catch as a fairy ! Who, indeed, did ever manage that ? Nor is it easy to catch the meaning of this fairy song by John Keats, one of the great English poets. It has this lesson for us, however : not to be sad at the waning year, the withering flower, for in the heart of the tree is the sap that will feed the new buds of the next spring, and even in the winter these are already being slowly born. It is a song of hope and cheerfulness.

SHED no tear ! O, shed no tear !
The flower will bloom another year.
Weep no more ! O, weep no more !
Young buds sleep in the root's white core.
Dry your eyes ! Oh ! dry your eyes !
For I was taught in Paradise
To ease my breast of melodies—
Shed no tear.

Overhead ! look overhead !
'Mong the blossoms white and red—
Look up, look up. I flutter now
On this flush pomegranate bough.
See me ! 'tis this silvery bell
Ever cures the good man's ill.
Shed no tear ! O, shed no tear !
The flowers will bloom another year.
Adieu, adieu—I fly, adieu,
I vanish in the heaven's blue—
Adieu, adieu !

THE SLUGGARD

Isaac Watts, who was born in 1674 and died in 1748, was a famous minister of the Gospel, who wrote many fine hymns and many very poor ones. As a poet he does not take a high rank ; but he was very earnest, and always sought in his rhymes to teach good lessons. There is good teaching and a touch of humour as well in these familiar verses by him.

'TIS the voice of a sluggard ; I heard him complain,
"You have waked me too soon ; I must slumber again ;"
As the door on its hinges, so he on his bed
Turns his sides, and his shoulders, and his heavy head.

"A little more sleep and a little more slumber ;"
Thus he wastes half his days, and his hours without number.
And when he gets up he sits folding his hands,
Or walks about saunt'ring, or trifling he stands.

I pass'd by his garden, and saw the wild brier,
The thorn and the thistle grow broader and higher ;
The clothes that hang on him are turning to rags,
And his money still wastes till he starves or he begs.

I made him a visit, still hoping to find
That he took better care for improving his mind ;
He told me his dreams, talk'd of eating and drinking,
But he scarce reads his Bible, and never loves thinking.

Said I then to my heart : "Here's a lesson for me,"
That man's but a picture of what I might be ;
But thanks to my friends for their care in my breeding,
Who taught me betimes to love working and reading.

THE NIGHTINGALE & GLOW-WORM

William Cowper was a great lover of animals, like all people of gentle nature. In this pretty little poem he tells us of a fancy that we could wish might be true, and though it is only a fancy, we are the better for having our minds thus engaged with tender thoughts for the "lower animals."

A NIGHTINGALE, that all day long
Had cheered the village with his song,
Nor yet at eve his note suspended,
Nor yet when eventide was ended,
Began to feel, as well he might
The keen demands of appetite.
When, looking eagerly around,
He spied far off, upon the ground,
A something shining in the dark,
And knew the glow-worm by his spark ;
So, stooping down from hawthorn top,
He thought to put him in his crop.
The worm, aware of his intent,
Harangued him thus, right eloquent—
"Did you admire my lamp," quoth he,
"As much as I your minstrelsy,
You would abhor to do me wrong
As much as I to spoil your song.
For 'twas the self-same power divine,
Taught you to sing, and me to shine ;
That you with music, I with light,
Might beautify and cheer the night."
The songster heard his short oration,
And warbling out his approbation,
Released him, as my story tells,
And found a supper somewhere else.

THE FOUNTAIN

James Russell Lowell, the writer of these happy lines, which express so well the feeling that comes to us in watching the play of a fountain on a summer day, was a famous American poet and humorist. He was born in 1819 and died in 1891.

Into the sunshine,
Full of the light,
Leaping and flashing
From morn till night!

Into the moonlight,
Whiter than snow,
Waving so flower-like
When the winds blow!

Into the starlight,
Rushing in spray
Happy at midnight,
Happy by day!

Ever in motion,
Blithesome and cheery,
Still climbing heavenward,
Never aweary;

Glad of all weathers,
Still seeming best,
Upward or downward
Motion thy rest;

Full of a nature
Nothing can tame,
Changed every moment,
Ever the same;

Ceaseless aspiring,
Ceaseless content,
Darkness or sunshine
Thy element;

Glorious fountain!
Let my heart be
Fresh, cheerful, constant,
Upward like thee!

BOY'S SONG

There is real joy of country life in this song of rural boy hood, by James Hogg, the Scottish shepherd poet, who was known as the "Ettrick Shepherd," having been born at Ettrick, in Selkirkshire, in 1770. He wrote many poems, chiefly of country life, that are still favourites, and died in 1835.

Where the pools are bright and deep,
Where the grey trout lies asleep,
Up the river and o'er the lea,
That's the way for Billy and me.

Where the blackbird sings the latest,
Where the hawthorn blooms the sweetest,
Where the nestlings chirp and flee,
That's the way for Billy and me.

Where the mowers mow the cleanest,
Where the hay lies thick and greenest,
There to track the homeward bee,
That's the way for Billy and me.

Where the hazel bank is steepest,
Where the shadow falls the deepest,
Where the clustering nuts fall free,
That's the way for Billy and me.

Why the boys should drive away
Little sweet maidens from the play,
Or love to banter and fight so well,
That's the thing I never could tell.

But this I know, I love to play,
Through the meadow, among the hay;
Up the water and o'er the lea,
That's the way for Billy and me.

THE BURIAL OF SIR JOHN MOORE

Sir John Moore was a great soldier who won the battle of Coruna, in Portugal, on January 16, 1809, but was killed on the battlefield. This solemn, dignified poem, describing his burial, was written by an Irish clergyman, Charles Wolfe, who died in 1823, and, although he wrote other poems, this is the only one that is remembered; but it is sure to live for ever.

Not a drum was heard, not a funeral note,
As his corse to the rampart we hurried;
Not a soldier discharged his farewell shot
O'er the grave where our hero we buried.

We buried him darkly, at dead of night,
The sods with our bayonets turning;
By the struggling moonbeam's misty light,
And the lantern dimly burning.

No useless coffin enclosed his breast,
Not in sheet or in shroud we wound him;
But he lay like a warrior taking his rest,
With his martial cloak around him.

Few and short were the prayers we said,
And we spoke not a word of sorrow;
But we steadfastly gazed on the face that was dead,
And we bitterly thought of the morrow.

We thought, as we hollowed his narrow bed,
And smoothed down his lonely pillow,
That the foe and the stranger would tread o'er his head,
And we far away on the billow!

Lightly they'll talk of the spirit that's gone,
And o'er his cold ashes upbraid him;
But little he'll reck, if they let him sleep on
In the grave where a Briton has laid him

But half of our heavy task was done
When the clock struck the hour for retiring;
And we heard the distant and random gun
That the foe was sullenly firing.

Slowly and sadly we laid him down
From the field of his fame fresh and gory;
We carved not a line, and we raised not a stone—
But we left him alone with his glory.

ALL'S RIGHT WITH THE WORLD

This is a splendid outburst of joy at the goodness of God. In these eight short lines Robert Browning has done more than others in long poems to convey the delight of being alive that comes to us on a beautiful morning in spring.

The year's at the spring
And day's at the morn,
Morning's at seven,
The hill's side's dew-pearled,
The lark's on the wing,
The snail's on the thorn,
God's in His heaven—
All's right with the world.

THE RAINBOW

In this little poem by Wordsworth occurs the famous line, "The Child is father of the man," which means that, what our character is in childhood, so will it be when we grow up.

My heart leaps up when I behold
A rainbow in the sky;
So was it when my life began,
So it is now I am a man,
So be it when I shall grow old,
Or let me die!
The Child is father of the man;
And I could wish my days to be
Bound each to each by natural piety.

THE ARAB'S FAREWELL TO HIS STEED

The Arab's devotion to his friend, the horse, is famous. But who, indeed, that is not a brute can fail to love his faithful horse, which serves him meekly and will always do its best for its master? The Hon. Mrs. Norton, one of the three lovely daughters of Richard Brinsley Sheridan, the dramatist, chose a fine subject in this poem, and she treated it with dramatic fitness and true feeling. It is a good poem to recite.

My beautiful! my beautiful! that standest meekly by,
With thy proudly-arched and glossy neck, and dark and fiery eye!
Fret not to roam the desert now with all thy winged speed:
I may not mount on thee again—thou'rt sold, my Arab steed!

Fret not with that impatient hoof, snuff not the breezy wind,
The farther that thou fliest now, so far am I behind.
The stranger hath thy bridle rein—thy master hath his gold;
Fleet-limbed and beautiful, farewell!—thou'rt sold, my steed, thou'rt sold.

Farewell! Those free, untired limbs full many a mile must roam,
To reach the chill and wintry sky which clouds the stranger's home.
Some other hand, less fond, must now thy corn and bed prepare;
The silky mane I braided once must be another's care.

The morning sun shall dawn again, but never more with thee
Shall I gallop o'er the desert paths, where we were wont to be;
Evening shall darken on the earth, and o'er the sandy plain
Some other steed, with slower step, shall bear me home again.

Yes, thou must go! The wild, free breeze, the brilliant sun and sky,
Thy master's home—from all of these my exiled one must fly.
Thy proud dark eye will grow less proud, thy step become less fleet,
And vainly shalt thou arch thy neck thy master's hand to meet.

Only in sleep shall I behold that dark eye glancing bright;
Only in sleep shall hear again that step so firm and light;
And when I raise my dreaming arm to check or cheer thy speed,
Then must I, starting, wake to feel—thou'rt sold, my Arab steed.

Ah! rudely then, unseen by me, some cruel hand may chide,
Till foam-wreaths lie, like crested waves, along thy panting side;
And the rich blood that's in thee swells in thy indignant pain,
Till careless eyes, which rest on thee, may count each starting vein.

Will they ill-use thee? If I thought—but no, it cannot be,
Thou art so swift, yet easy curbed; so gentle, yet so free;
And yet, if haply, when thou'rt gone, this lonely heart should yearn,
Can the hand that casts thee from it now command thee to return?

Return!—alas, my Arab steed! what shall thy master do,
When thou, who wert his all of joy, hast vanished from his view?
When the dim distance cheats mine eye, and through the gathering tears
Thy bright form, for a moment, like the false mirage appears?

Slow and unmounted shall I roam, with weary step alone,
Where with fleet step and joyous bound thou oft hast borne me on;
And, sitting down by that green well, I'll pause and sadly think,
"'Twas here he bowed his glossy neck when last I saw him drink!"

When last I saw thee drink!—away! The fevered dream is o'er!
I could not live a day and know that we should meet no more!
They tempted me, my beautiful! for hunger's power is strong—
They tempted me, my beautiful! but I have loved too long.

Who said that I had given thee up? Who said that thou wert sold?
'Tis false!—'tis false! my Arab steed! I fling them back their gold!
Thus, thus, I leap upon thy back, and scour the distant plains!
Away! who overtakes us now may claim thee for his pains!

THE UNSEEN PLAYMATE*

Robert Louis Stevenson in this poem, which is reprinted from "A Child's Garden of Verses" by permission of Messrs. Longmans, Green & Co., has written a beautiful piece of fancy. He almost makes us see this unseen playmate. He means, of course, the gentle spirit of happiness and of true childhood joy, which makes each little boy or girl never feel lonely, as it should be present in each one.

When children are playing alone on the green,
In comes the playmate that never was seen.
When children are happy and lonely and good,
The Friend of the Children comes out of the wood.

Nobody heard him and nobody saw,
His is a picture you never could draw;
But he's sure to be present, abroad or at home,
When children are happy and playing alone.

He lies in the laurels, he runs on the grass,
He sings when you tinkle to musical glass;
Whene'er you are happy and cannot tell why;
The Friend of the Children is sure to be by!

He loves to be little, he hates to be big,
'Tis he that inhabits the caves that you dig;
'Tis he, when you play with your soldiers of tin
That sides with the Frenchmen, and never can win.

'Tis he, wnen at night you go off to your bed,
Bids you go to your sleep and not trouble your head;
For wherever they're lying, in cupboard or shelf,
'Tis he will take care of your playthings himself!

* From "Poems and Ballads," copyright, 1895, 1896, by Charles Scribner's Sons

THE ARAB'S FAREWELL TO HIS STEED

My beautiful! my beautiful! that standest meekly by,
With thy proudly-arched and glossy neck, and dark and fiery eye!

Fret not to roam the desert now with all thy winged speed:
I may not mount on thee again—thou'rt sold, my Arab steed!

THE STARS

In the poem "The Star," printed on page 1124, we have verses written specially for children. But Barry Cornwall, whose real name was Bryan Walter Proctor, wrote this little poem of "The Stars" for all readers, young or old. In it he has caught the quiet beauty of the night, and you will notice that instead of expressing wonder as to what the stars may be, he is content to think of them as among the glories of God's world, that fill our souls with reverence and peaceful joy.

They glide upon their endless way,
For ever calm, for ever bright,
No blind hurry, no delay,
Mark the Daughters of the Night;
They follow in the track of Day,
In divine delight.

And oh! how still beneath the stars
The once wild, noisy Earth doth lie;
As though she now forsook her jars,
And caught the quiet of the sky.
Pride sleeps; and Love (with all his scars)
In smiling dreams doth lie.

Shine on, sweet orbed souls, for aye,
For ever calm, for ever bright:
We ask not whither lies your way,
Nor whence ye came, nor what your light.
Be, still—a dream throughout the day,
A blessing through the night!

EXCELSIOR

Written by the famous American poet, Henry Wadsworth Longfellow, this poem may seem strange at first reading. We must know that the word "excelsior" comes from a Latin word meaning "ever upward;" then the poem is quite clear. The youth wished to excel, and he heeded no warnings, no inducements to remain in comfort and safety, but went striving upward and at last suffered death in the snowstorm. But to the end he stood by his motto, which is a noble one, and, whether we fail or succeed, it is always a noble thing to try to excel. That is the real meaning of the poem.

The shades of night were falling fast,
As through an Alpine village passed
A youth, who bore, 'mid snow and ice,
A banner with the strange device:
Excelsior!

His brow was sad; his eye beneath
Flashed like a falchion from its sheath,
And like a silver clarion rung
The accents of that unknown tongue:
Excelsior!

In happy homes he saw the light
Of household fires gleam warm and bright;
Above, the spectral glaciers shone,
And from his lips escaped a groan:
Excelsior!

"Try not the pass!" the old man said,
"Dark lowers the tempest overhead,
The roaring torrent is deep and wide!"
And loud the clarion voice replied:
Excelsior!

"O stay!" the maiden said, "and rest
Thy weary head upon this breast!"
A tear stood in his bright blue eye,
But still he answered with a sigh:
Excelsior!

"Beware the pine-tree's withered branch!
Beware the awful avalanche!"
This was the peasant's last good-night!
A voice replied, far up the height:
Excelsior!

At break of day, as heavenward
The pious monks of Saint Bernard
Uttered the oft-repeated prayer,
A voice cried through the startled air:
Excelsior!

A traveller, by the faithful hound
Half buried in the snow, was found,
Still grasping in his hand of ice
That banner, with the strange device:
Excelsior!

There, in the twilight cold and grey,
Lifeless, but beautiful, he lay,
And from the sky, serene and far,
A voice fell, like a falling star:
Excelsior!

YE MARINERS OF ENGLAND

When Thomas Campbell wrote this famous song, perhaps the finest patriotic song in our language, all warships were still made of wood—England's "wooden walls" they were called—but though they are now built of massive steel plates, the feeling that inspires the brave sailors is still the same as in the days of Nelson, who won the great battle of Trafalgar when the poet Campbell was 28 years of age.

Ye mariners of England,
That guard our native seas;
Whose flag has braved, a thousand years,
The battle and the breeze!
Your glorious standard launch again,
To match another foe!
And sweep through the deep,
While the stormy winds do blow;
While the battle rages loud and long,
And the stormy winds do blow.

The spirit of your fathers
Shall start from every wave!—
For the deck it was their field of fame,
And ocean was their grave:
Where Blake and mighty Nelson fell,
Your manly hearts shall glow,
As ye sweep through the deep,
While the stormy winds do blow;
While the battle rages loud and long,
And the stormy winds do blow.

Britannia needs no bulwarks,
No towers along the steep;
Her march is o'er the mountain waves,
Her home is on the deep.
With thunders from her native oak
She quells the floods below,
As they roar on the shore,
When the stormy winds do blow;
When the battle rages loud and long,
And the stormy winds do blow.

The meteor flag of England
Shall yet terrific burn;
Till danger's troubled night depart,
And the star of peace return.
Then, then, ye ocean warriors,
Our song and feast shall flow
To the fame of your name,
When the storm has ceased to blow;
When the fiery fight is heard no more,
And the storm has ceased to blow.

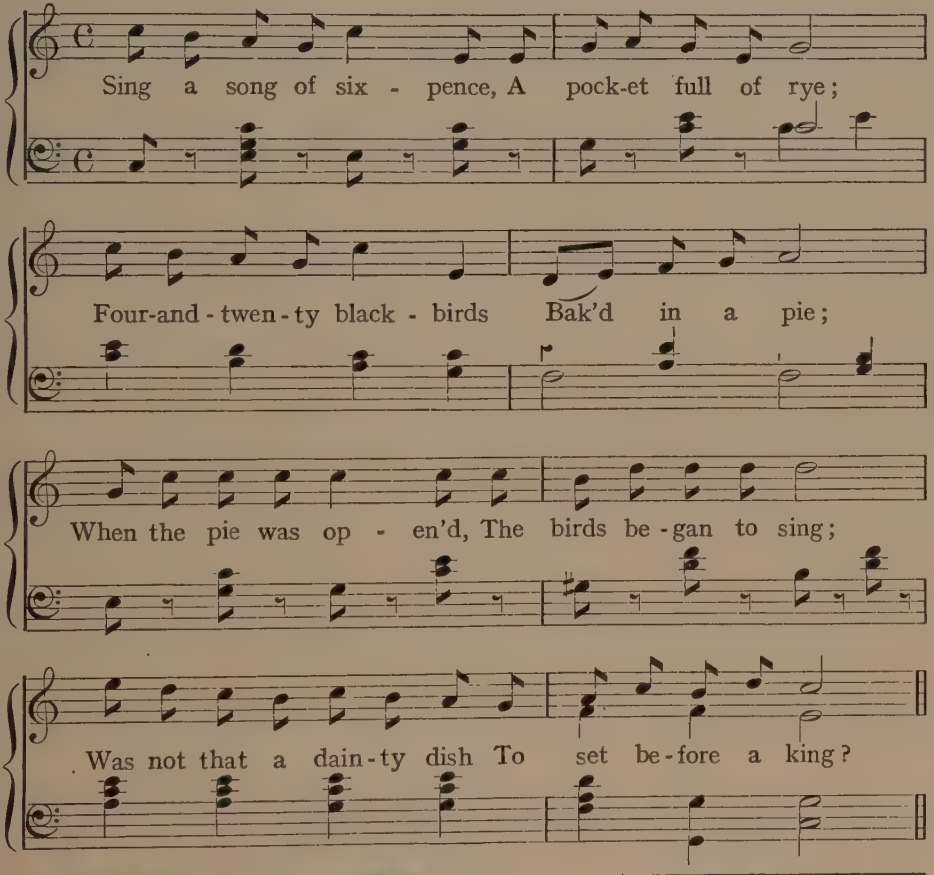
SING A SONG OF SIXPENCE

Sing a song of sixpence,
A pocket full of rye ;
Four-and-twenty blackbirds
Bak'd in a pie ;

When the pie was open'd,
The birds began to sing ;
Was not that a dainty dish
To set before a king?

The king was in his counting-house,
Counting out his money ;
The queen was in the parlour,
Eating bread and honey ;

The maid was in the garden
Hanging out the clothes,
Down came a blackbird
And snapped off her nose.


Sing a song of six - pence, A pock-et full of rye;
Four-and-twen-ty black - birds Bak'd in a pie;
When the pie was op - en'd, The birds be-gan to sing;
Was not that a dain-ty dish To set be-fore a king?

TOM THUMB

CONTINUED FROM PAGE 560

Not far from Fairyland lived a man and his wife who were often sad because they had no child.

They looked so gentle and kind-hearted that the wizard Merlin thought he would go and see if they really deserved to be happy. So one day he dressed himself in an old ragged coat and knocked at their door.

"Come in," said the old woman. "Won't you sit down and rest a little? We are very poor, but I am preparing some bread and milk for my husband's dinner, and I will make you some too."

"That is very kind of you," answered the old man, throwing off his cloak. "I am the wizard Merlin, who can do all things, and because you have been generous and thoughtful for others I will make you a gift. You may choose what it shall be."

"Oh, please," cried the old woman, "we want a little child! Even if it were no bigger than my thumb we shouldn't mind."

"Very well," said the wizard, smiling, and he went away.

When the man and his wife woke up the next morning there lay beside them a little child, a boy, so tiny that he really was no bigger than his mother's thumb. When the fairy godmother came she told the old people that he would never grow any bigger. So they called him Tom Thumb.

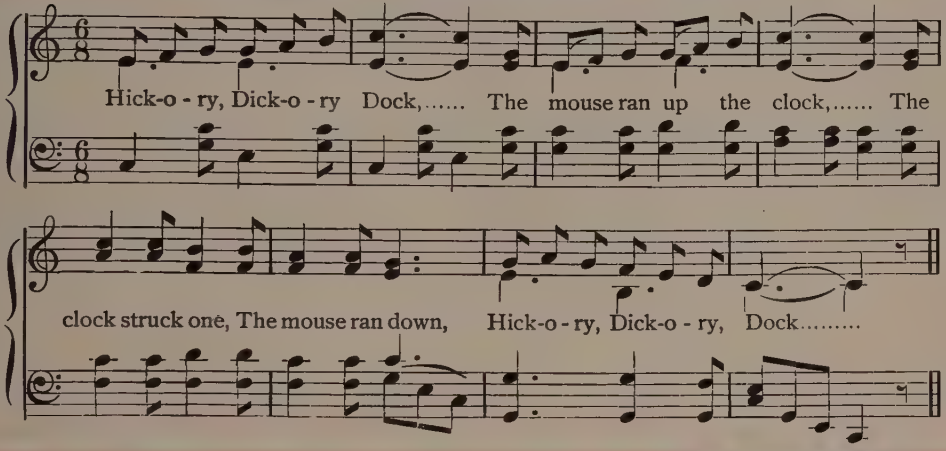
Tom was so small that his godmother had to call for the help of the other fairies to make him a suit of clothes.

They made him a shirt out of a cobweb, a coat of a beetle's wing, shoes of the skin of a mouse, and a cap out of an oak-tree leaf. When everything was ready Tom's godmother gave him a little magic sword, which she told him always to wear.

TOM THUMB BEFORE THE KING AND QUEEN

Hickory, Dickory, Dock.

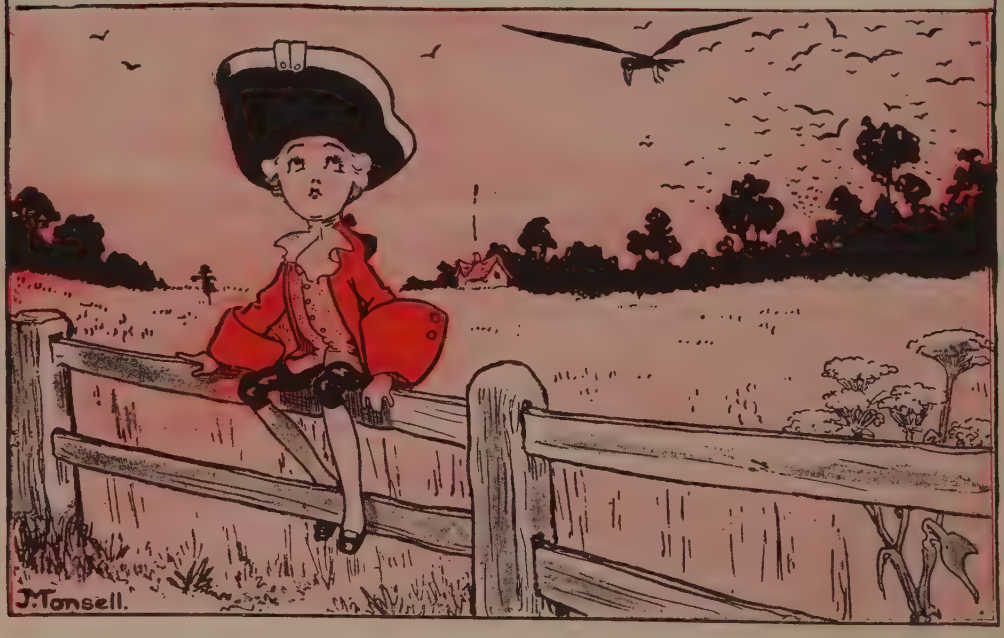
HICKORY, DICKORY, DOCK



O, all you little Blackie-tops

O, all you little Blackie-tops,
Pray do not eat my Father's crops
While I lie down to take a nap.
Shua O! Shua O!

If Father he perchance should come
With his cocked hat and his long gun,
Then you must fly, and I must run.
Shua O! Shua O!



Tom was a good boy, but he had one bad fault: he was very inquisitive. One day, when his mother was making a pudding, there came a knock at the door, and she went to see who was there. She was away so long that Tom began to wonder what was inside the bowl that his mother had been stirring.

He got off his chair, which always stood on the table, and walked round and round the basin, wishing that he could see over the top. By the side of the basin lay a fork.

"Hurrah!" cried Tom, seizing the fork. "This will make a capital ladder."

And he climbed up the prongs until he could reach the top of the basin. But even then he could hardly see in, for his head only just reached the top.

"I know," said he, "I'll jump."

Tom put both hands on the edge of the basin and jumped. He jumped once, but not quite high enough; he jumped again, but still he could not see. So he jumped a third time, and this time he jumped right into the basin.

At this moment his mother came back, and, taking up the big wooden spoon, was about to stir it again, when she saw something moving in the basin. This so frightened her that she took up the basin and threw everything in it as far as she could out of the window

Underneath the window flowed a river, and as Tom tumbled out headlong a big fish came swimming by. The fish opened his mouth and—in fell Tom.

The fish was caught, and it was so fine a fish that it was taken to the palace for the King's dinner. As the cook cut open the fish out jumped Tom upon the table. When the King heard of it, he was so astonished that he ordered Tom to be brought before him.

"Where do you come from, and what is your name?" asked the King, putting on his glasses and looking down at him.

Tom told his story, and the King was so pleased that he allowed Tom to stay with him and live in the palace.

It was all very splendid, and for a long time Tom enjoyed himself and was very happy. When the King went for a ride, Tom went too, only, instead of a horse, Tom rode on the back of a great rat.

As they were riding in the forest one day, a big cat sprang out, and, pouncing on the rat and its rider, carried them off into a tree. Tom took out his magic sword, and after a brave fight he killed the cat. Then he turned and began to climb down the tree. But it was a long way for little Tom's legs, and he had not got far when he felt his foot slipping, and in a minute he would have fallen and been killed. Just then, however, the King missed Tom, and, looking round, he was just in time to catch him as he fell.

Tom had had such a fright that, when he got back to the palace, he felt quite ill and had to go to bed. In the morning the King came to his bedside and found him very miserable.

"What is the matter?" asked the King.

"I want to go home," sobbed Tom.

"Nonsense!" said the King. "You have everything you can ask for, and you ought to be very happy."

"I want my mother. Please let me go home."

"Certainly not!" said the King. "You must stay here till I am tired of you."

"Oh dear!" sighed Tom. "And when will that be?"

"I don't know," said the King. "I like you very much at present."

All that day Tom wondered how he could get away without being caught; but the more he wondered the more miserable he became, and the more he wanted his mother.

He worried so that he became thin and ill, and at last his fairy godmother, thinking that he had been punished enough for his inquisitiveness, determined to help him. So she went to Tom's bedside, and Tom, jumping for joy, begged to be taken home.

The carriage was waiting on the window-sill. They got in, and away they sailed, over the house-tops, till they came to the cottage where Tom lived.

When they saw Tom again, his father and mother cried for joy, and they all lived happily together for the rest of their lives.

THE LAND OF THE RED DAISIES

A FAIRY and a witch fell out about a magic ring, and they came to the young and handsome King of the country and asked him to decide to which of them the ring belonged. The fairy said the witch had stolen it from her, and the witch said that she had bought it from a magician in the Land of Red Daisies.

The King looked at the ring, and, finding no name upon it, he handed it to the witch, and said:

"Let me see what enchantment you can work with it."

The witch rubbed the ring, and nothing wonderful appeared.

The King then handed the ring to the fairy, and she kissed it and touched his silver throne with it, and the throne turned into pure gold.

"Rings belong to those who can use them," said the King, giving the ring to the fairy.

"And asses' heads belong to those who deserve them," said the witch, touching the King with her wand.

The courtiers gave a cry of horror. The King had become a man with an ass's head. But the fairy said to him:

"Love can cure the effects of hate. Marry at once a sweet and trustful wife, and the spell will soon be removed."

The King then commanded all the young girls in the country to assemble before his palace so that he might choose one of them to be his bride. He looked at each of them in turn, and each of them in turn started back in disgust at the sight of his ass's head, and he sadly dismissed them all. As he was coming away he saw something moving behind a tree, and found there a pretty beggar-maid. Being barefooted and clothed in rags she had been ashamed to stand among the other girls. The King looked at her, and, finding that her eyes were full of pity, shyness, and love, he exclaimed: "You shall be my Queen."

He appointed ten maids of honour to array her in beautiful robes and glittering jewels, and then he led her to the cathedral, where they were married.

"Now," he said, "do not seek to know anything about me until to-morrow morning, and then you shall know everything."

But in the night the young Queen touched her husband's head and felt

The King, who had become a man with an ass's head, called all the young girls before him. He looked at the beggar-maid, whose eyes were full of pity, shyness, and love. "You shall be my Queen," he said.

that he had a human face; and she got up and lighted a candle and looked at him. Yes, it was true! The ass's head had disappeared, and he was a young and handsome man again. She made a movement of joy, and tipped up the candle. A drop of burning grease fell upon her husband's hand, and he awoke and said:

"Unhappy girl! To-morrow morning the spell would have been entirely removed. Now the witch has regained her power over me, and I must go and live with her in the Land of Red Daisies."

In a moment he was gone; but the young Queen felt that she could not live without him, and set out to find the Land of Red Daisies.

Outside the palace she met the fairy.

"Please show me the way to the Land of Red Daisies," said she.

"That is the place where the witch lives," said the fairy, "and I have never been there. But take my magic ring, and it will, perhaps, help you."

And so it did. The young Queen had only to kiss it and touch a stone with it, and she obtained gold to buy food and lodging with. In this way she wandered to the end of the country and came to a hut on the edge of a great desert. In the hut was a little old woman, and the young Queen said to her:

"Please show me the way to the Land of Red Daisies."

"I do not know where it is," said the little old woman, "but my pig often goes there and comes back laden with precious things. It departs suddenly, and I can never tell when it is about to go."

"Very well," said the young Queen, "I will sleep beside your pig, and wait until it sets out for the Land of Red Daisies, and then follow it."

She lay down in her beautiful robe in the straw beside the pig. In the middle of the night the pig shook itself and ran out, and she followed it, and came through the great desert into a strange, red land. The daisies were red, and the grass was red, and the leaves of the trees were red, and amid the trees stood a strange, red palace.

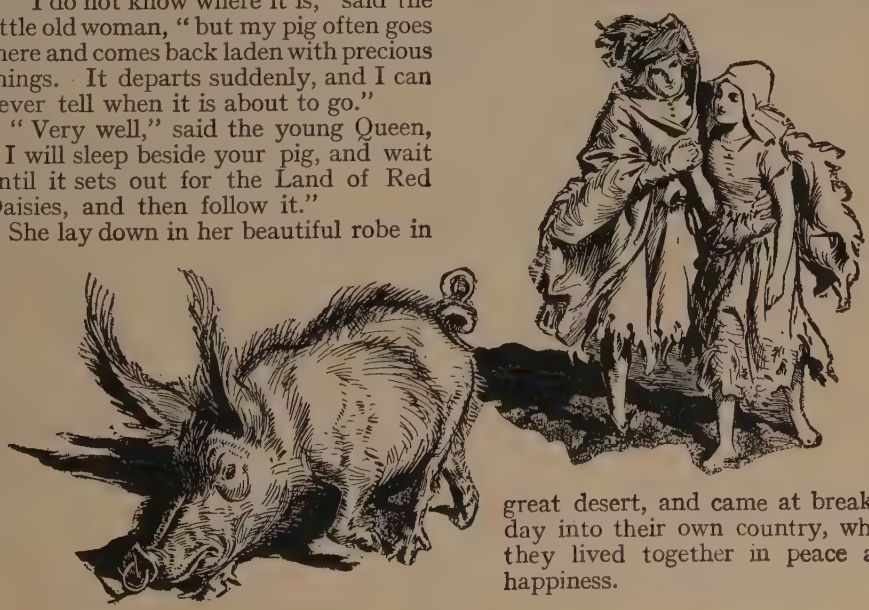
She tied the pig to a tree, and in the wood she met a ragged peasant girl, whom she persuaded to change clothes with her. Then she went to the red palace and was engaged as a maid.

"You must work very hard and help me to get the feast ready," said the cook. "Our mistress is a witch, and her daughter is about to marry the King of the country beyond the great desert."

"That is my husband," said the young Queen to herself, and, going upstairs, she peeped into the room where he was sitting, and saw that it was so.

In the middle of the night she got out of bed and came to the room where he slept, and lighted a candle and awakened him. He was bewitched, and did not recognise her. But he remembered everything when she kissed the magic ring and touched him with it.

They crept softly downstairs and got out of the palace, and found the tree to which the pig was tied. The poor animal was very hungry, and as soon as it was released it started back home. They followed it in the moonlight, across the great desert, and came at break of day into their own country, where they lived together in peace and happiness.



THE WITCH OF THE FOREST TREE

PRINCE MIRKO was the son of a King of Hungary. His father died fighting in a battle with the Tartars, and Mirko was forced to fly for his life. After riding for seven days he came to a palace made of diamonds. It was a dark night, and Mirko was tired and hungry. So he boldly entered the gate of the palace, and was astonished to find no one living in it. There was an excellent dinner in the dining-room, and, after eating, Prince Mirko went into a bed-room and laid down to sleep. He had scarcely closed his eyes when seven great, fierce Tartars came thundering into the palace.

"Ho, ho," cried the tallest of the Tartars, "I smell Christian blood!" And, rushing upon Mirko, he hacked him into little pieces, and threw the pieces out of the window. The next morning a lovely girl crept from a hiding-place beneath the palace and poured over the pieces the water of life. Mirko at once sprang up, stronger and handsomer than before, and the lovely girl disappeared.

"Ho, ho," cried the tallest of the Tartars, "the little Prince has come to life!" And he hacked Mirko again into little pieces. On the second morning the same thing happened. On the third morning the lovely girl again poured the water of life upon Mirko, and said to him: "I am the Princess of this castle. The Tartars have killed my father. But I need hide no more, for you are stronger than them all."

So, indeed, he was. With one stroke of his sword he killed the seven Tartars, and he and the Princess then set out to find their fathers and pour upon them the water of life. At night they entered a forest, and lighted a fire beneath a tree.

"How cold it is!" said a voice overhead. They looked up, and saw a Tartar witch sitting in the tree.

"Throw this powder on the fire," said the witch, "and it will burn better."

Mirko did so, and a strange smoke arose, and the witch descended, saying:

"You killed my children, the seven Tartars. Now it is your turn to die!"

Mirko felt the magic stealing over him, and called on the Princess to help him. But the strange smoke had overcome her. Mirko carried the water of life, and he poured some quickly over her, and over himself, and they then caught the witch and forced her to lead them to where their fathers were buried.

The Prince and Princess lighted a fire in a great forest. "How cold it is!" said a voice overhead. They looked up and saw a witch sitting in the tree.

"I seem to have slept a long time," said the old King, rubbing his eyes, as the water touched him. The Princess's father said the same thing.

Soon afterwards Mirko married the Princess, and his father gave up his throne and made them King and Queen.

THE EAGLE-GIRL OF THE MOUNTAINS

ONE morning a potter's wife in Northern India went to the mountains to get some clay that her husband needed, and she took her little baby girl with her.

On reaching the mountains she put the child down, and turned to look for the clay; and a great eagle then swooped down and carried the child to his nest. But the little girl was not afraid of him. She clung to his neck and laughed and played, and so won his heart that he resolved to adopt her as his daughter. He fed her on fruits, and nuts, and wild honey, and taught her to climb about the mountain-top.

At first he stole peasant's clothes for her from the villages in the plain. Then, as she became older, he determined that she should wear princely robes, and he flew into the King's palace, and took one of the old Queen's dresses. She soon wore it out in clambering about the rocks, and he had to steal so many dresses for her that the Queen told her son to kill the eagle.

The Prince, however, did not want to kill the eagle at once. He wondered what a bird wanted with so many dresses, and he resolved to find this out.

He climbed for months about the mountains, and at last he heard a girl singing sweetly above him, and, clambering up, he found the Eagle-Girl sitting in the eagle's nest. Her beauty fascinated him, and after listening to the wonderful story of her life he begged her to come down to the palace and be his wife. She went down with him, and the Prince went to his father, the King, and told him all that had happened. The King kissed the beautiful Eagle-Girl, and ordered preparations to be at once made for the wedding.

But the old Queen did not want her son to be married to a strange girl, and she told two men to take the bride away and throw her into the river. And they did so. But the eagle heard her cries, and brought her back to the palace. The next day she was married to the Prince; and, to punish the Queen, the King retired from the throne, and the Eagle-Girl became Queen.

The Prince heard a girl singing sweetly above him. He clambered up and found the beautiful Eagle-Girl.

THE COBBLER AND THE ELVES

HANS STUMPIE was a cobbler who lived with his wife in the Forest of Thuringia, in Germany, where all the countryfolk wore wooden shoes.

As Hans made only leather shoes, he had a hard task to get a living, and things went from bad to worse, and at last he had nothing left in the house but a bit of leather scarcely large enough to make one pair of shoes. Hans cut the leather out very carefully, and went to bed.

When he came down in the morning —oh, wonder of wonders !—there, on the board, were the shoes already made. And a customer came in and bought them at a good price, and with the money Hans got some food and also purchased a larger piece of leather. He cut this out into the stuff for two pairs of shoes, and in the morning he found the two pairs made, and he sold them in the course of the day.

Then he purchased leather enough for four pairs of shoes, and cut them out, and in the morning there were four pairs made. So it went on. No matter how many pairs he cut out overnight, they were all made for him the next day. And the end was that he became a very prosperous man.

Just before Christmas, Hans and his wife sat up to see who it was that made the shoes, and at midnight in jumped two wee men, and they squatted down on the board, and took up the pieces of leather, and sewed away so quickly that Hans and his wife could not follow the movements of their hands. When all the work was done, the two wee men went away.

The next morning Hans' wife said to him :

" Now that the two wee men have made us rich, we must do something for them. I have it ! I will make them some clothes, and you must make them some shoes."

TWO TINY MEN CAME IN THE NIGHT AND CUT UP THE COBBLER'S LEATHER

So the next night Hans and his wife put the clothes and shoes on the board for the little creatures, and watched to see what they would do. The two wee men were at first astonished to find that no leather had been cut for them to work on. Then they saw the clothes and shoes, and put them on, and danced merrily about the room, singing :

" Neat and natty boys are we ;
Cobbler's elves no more we'll be."

They hopped over the chairs, they hopped over the tables, and at last they hopped out of the window, and they never came back. But Hans always prospered in his work, and he and his wife lived in ease and happiness all the rest of their lives.

THE BOY AT THE GIANT'S CASTLE

MANY years ago a boy wandered about the New Forest looking for some strayed sheep, and came to a giant's castle.

"I've eaten your sheep," roared the giant, "and if you're not careful I'll eat you. See how strong I am!" He took up a rock and squeezed it to bits.

"But can you wring water out of a stone?" said the boy. "See how much stronger I am!" And, taking a piece of cheese out of his pocket, he pressed it until the whey ran out.

The giant was wonder-struck, and asked the boy to help him get some firewood. He found a great oak, and bent it down, and told the boy to hold it while he cut it. But when the boy tried to do so, the tree sprang up and sent him flying through the air.

"That's a favourite trick of mine," said the boy. "Can you leap as high as that?"

The giant would not try. When he had felled the oak, the boy said:

"The root end's the heavier, so I will take that. You take the top end."

When the tree was balanced on the giant's shoulder, the boy jumped up and hid in the branches. The giant groaned under the burden, and, staggering into the castle yard, threw down the tree wearily, and the boy leaped off and pretended that he had just let the root end fall.

"Surely you're not tired," said the boy. "I'm as fresh as when we started."

"If I don't kill this mighty creature to-night," muttered the giant, "he will master me in the morning."

But the boy was too wide awake to go to sleep. He soaked his bolster with water, and put it in his bed, and waited behind the door. At midnight the giant entered and struck a blow at the bolster; then, as the water spurted into his face, he went away, saying:

"Ha! That knocked all the blood out of him!"

The next morning the boy came gaily downstairs, and said that a flea had bitten him in the night. The giant looked at him in terror. When breakfast came, he was still more terrified to see how much porridge the boy swallowed, and how fat he grew.

"How do you manage to eat so much?" he said.

"Well," said the boy, "after eating all I can, I cut myself open, and then begin to eat again."

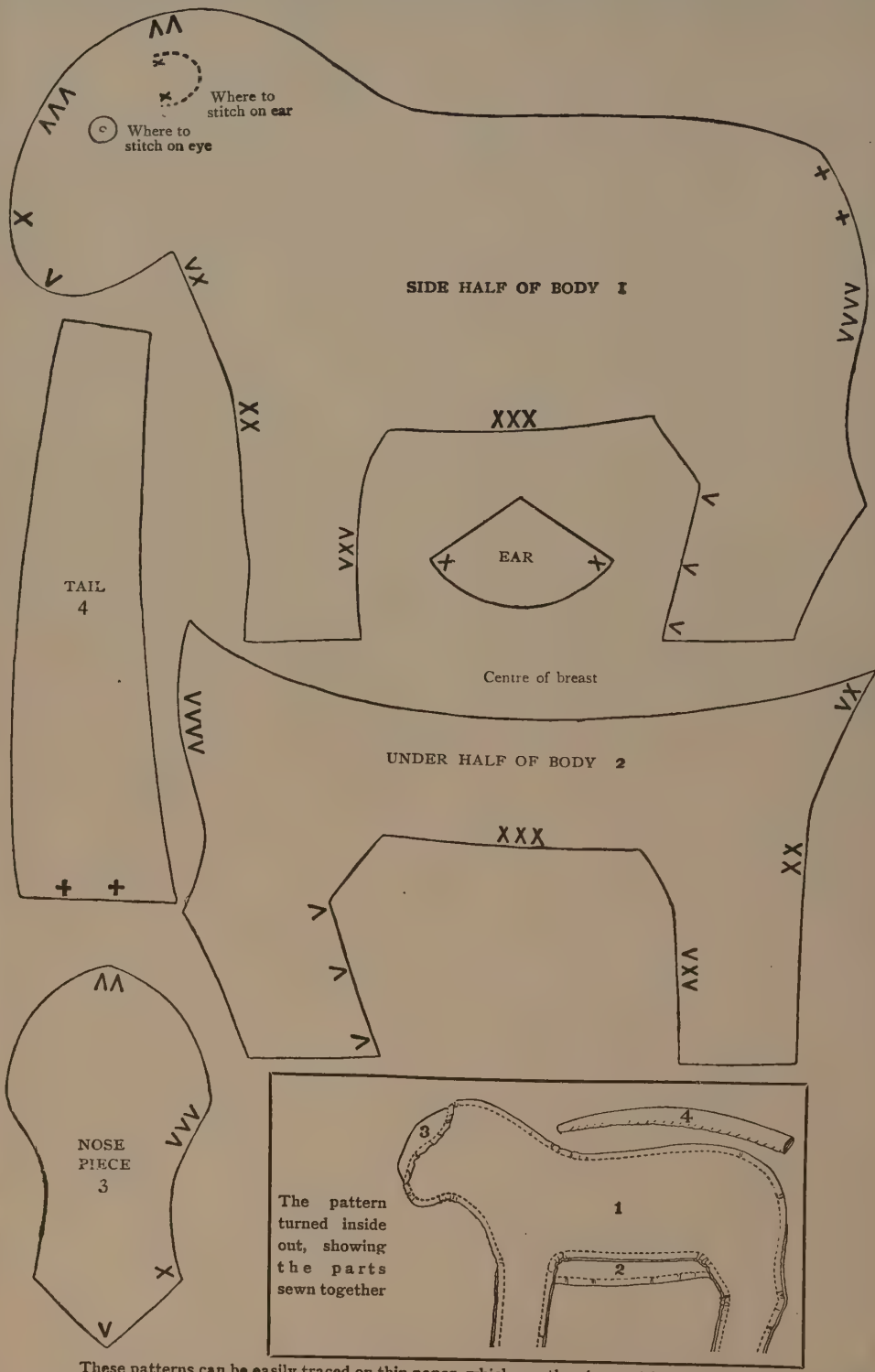
The boy had tied the bolster-cover round his neck, under his clothes, and he poured the porridge there, instead of eating it. He now cut open the bolster-cover, and let out the porridge.

"That's really a good trick," said the giant. So, taking a great carving knife, he stabbed himself, and fell down dead, and the boy then became master of the castle and lord of its treasures.

THE BOY JUMPED INTO THE TREE, AND THE GIANT STAGGERED UNDER THE BURDEN

THE NEXT STORIES ARE ON PAGE 811.

PATTERNS FOR THE TIGER, TO BE TRACED & CUT OUT



These patterns can be easily traced on thin paper, which can then be used for cutting out

WHAT THESE PAGES TEACH US

THESE pages begin with more instructions for our toy Zoo, which began on page 575, where we learned how to make a cat. By placing a piece of tissue-paper over these patterns you can draw the patterns quite easily, so as to be able to cut them out without spoiling the book. We continue the building of Modeltown by making a large shop, for which instructions and plans begin on page 571. With our girl's work-basket we learn how to proceed with the dressing of a doll; our gardener tells us what to do in the middle of May; and the games on page 724 are specially suited to the fine weather of May.

CONTINUED FROM PAGE 582

A LION AND TIGER FOR OUR TOY ZOO

THIS time we are going to add a lion and a tiger to our Zoo. Our lion is made of smooth beaver cloth that will not fray.

After the pattern is all cut out, there will be seven pieces: two upper halves (the whole outline) to face each other, two under halves to face, one nose piece, one tail piece, and the ear. Get the nose piece in place first.

Now look at the diagram on page 716 and observe the following instructions.

Put x to x on the animal's head, and stitch carefully right down to v. The two edges are quite a different shape, but take no notice of this, go straight on, and make them come together. When you get down to point v, fasten off the thread. Then put the throat part of the two halves together, and

THE LION AND TIGER FOR OUR TOY ZOO, MADE AS DESCRIBED IN THESE PAGES

stitch up till you come to where you left off. Then go up the other side of the nose to x again. Next get the two under halves in place, as they are the exact shape of the upper halves which they fit.

Leave the openings for the legs open. Next stitch from x on the top of the head right down the back to where the under parts are joined on. The shape can now be filled, beginning at the head.

Now take four pieces of wood, one and a quarter inches long and about as thick as a thin slate-pencil, and cut four pieces of cloth, each half an inch longer than the wood and wide enough to wrap it in comfortably. Sew each piece of wood into a piece of cloth, bringing the edge of the cloth to the end of the wood at one end, and taking a thread or two of cotton over to keep the wood from slipping out, and at the other end round off the edge of the extra half an inch, sew four or five stitches round it to keep it folded together (these stitches will represent the lion's toes), and catch it back with a stitch or two at right angles with the leg, so as to form a foot.

Now push each of these legs into one of the holes left for them, leaving about three-quarters of an inch showing of the front legs and half an inch of the back ones, and make the feet turn the right way.

Having made sure that all the legs are the same length and in good position, sew down the edge of the cloth of the upper part of leg on to the under-leg. As it is thick and firm it will not need to be turned in. The upper part of the back legs will seem a little too large. This is quite as it should be; it is to be sewn up to look like the big joint of the hind leg. If the front ones also seem too large, the extra piece can be disposed of in the same way.

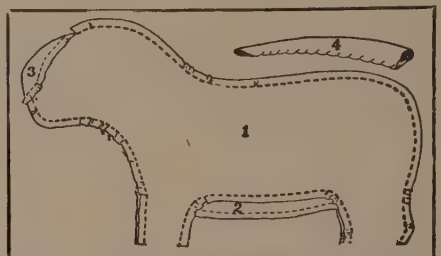
The tail piece of cloth must be rolled up till it is as thin as a pipe, and sewn along with a tuft of mending worsted to match the cloth fastened in at the end. Round the corners off at the other end, and hem neatly into the proper position. The nostrils are marked by stitches of black worsted in the seams of the nose; the mouth goes grimly across the chin in the way shown in the little sketch on the next page. The eyes should be made of amber beads or sequins. The mane, which goes all round the face and head, leaving only the nose and

chin showing, is made of worsted to match the cloth, sewn on in tufts of half a dozen strands, three inches long, doubled. The ears, almost hidden by the mane, are shaped like the cat's ears, but as the cloth will not fray, a single thickness will do.

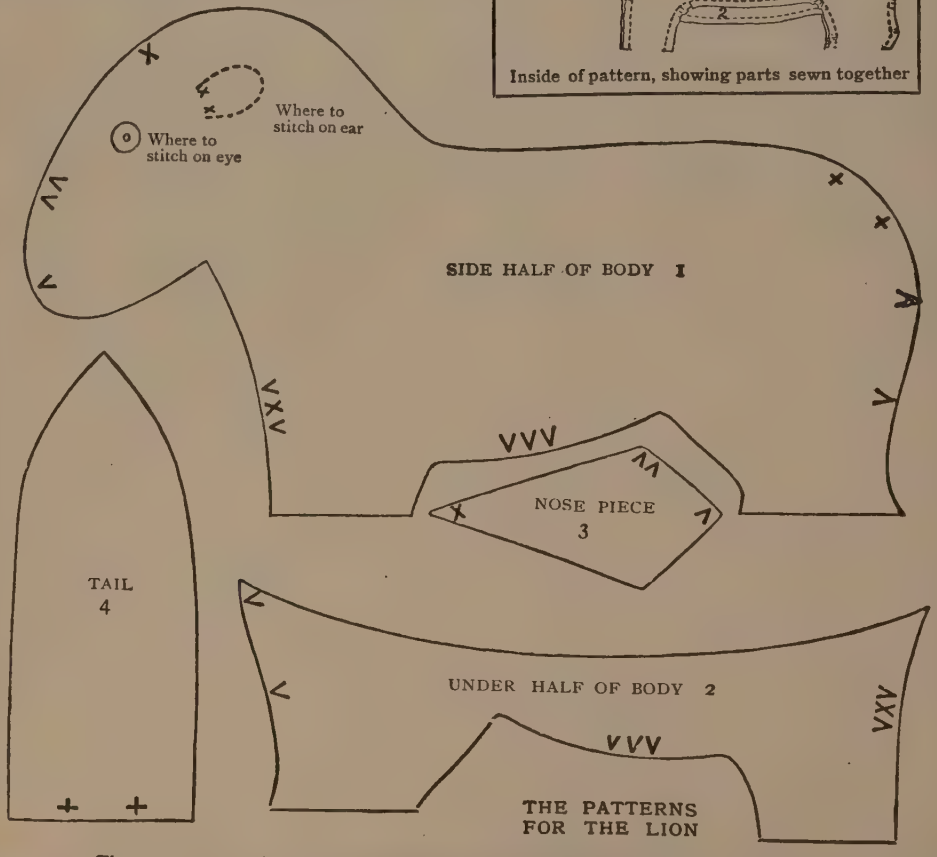
The tiger is made in very much the same way as the lion, but of orange-brown velveteen. A quarter of a yard is ample. The chief difference is in the legs, as velveteen is not too thick to turn, and cannot be left raw-edged. The wood for the front legs must be one and a half inches long; for the back legs, one and three-quarter inches only, as in the hind legs it is only to reach the big joint. Cover the wood with velvet, forming the paws in the same way as in the lion, and push it up the "trouser-legs" waiting for it. It should meet the stuffing in the body, and, in the case of the front legs, be embedded in it, so as to prevent the wood from showing at the shoulder. It is sometimes well to leave an opening in the under-seam till quite the last, that a piece of extra stuffing may be pushed into the thighs if necessary.

When only the paws are visible, turn in the bottoms and hem down on to the paws. Then take the extra material and sew it tightly together on the inner side of the leg as far up as where the joint should come. From that point it may be left, and filled up with wadding, to show the shape of the thick upper part of the leg.

The tiger has green beads or sequins for eyes, and tufts of white cotton for whiskers. His nose and mouth are made just like those of the lion, and his stripes, copied from a picture, are marked with pen and ink. His ears are just like the cat's, only, of course, much smaller, as the animal is on a much smaller scale. The tail, which is longer than the lion's, has both edges rolled till the two rolls meet in the middle and are sewn together. This is the under side of the tail, of course, and the tip must be tapered to a point.



Inside of pattern, showing parts sewn together



THE PATTERNS FOR THE LION

These patterns can be easily traced on thin paper, which can then be used for cutting out

WHAT TO DO WITH A GIRL'S WORK-BASKET

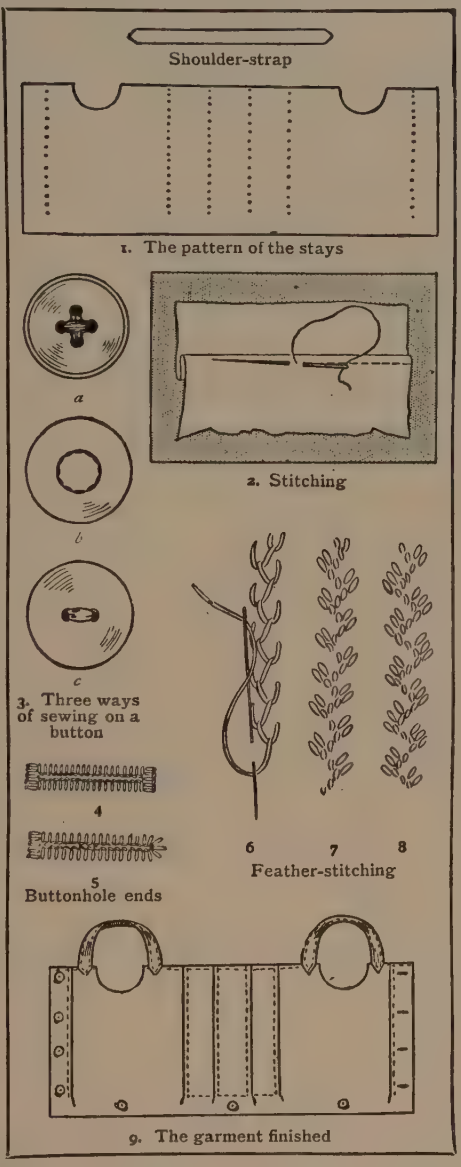
3. The Doll's Little Stays

LAST time we made the doll's little chemise; to-day we are going to make the stays, which are made just like a little girl's corsets. A straight band of material, of either twill or coutil, is all that we need. The band should be about 3 or 4 inches deep, according to the size of the doll, and as long as is necessary to go round the body—about 8 or 9 inches.

Fold this piece of material exactly in half to mark the middle of the front, and form a box-pleat about one inch wide. A box-pleat is, of course, made like a very wide tuck which is opened and laid flat in such a way that the stitching comes together in the centre underneath. Tack this down, and then make another tuck half the width of the pleat—an ordinary tuck this time—each side of the box-pleat, and lay them so that they fold outwards. Pictures 1 and 9 explain this quite clearly. When these have been tacked firmly, they should be stitched along each edge with the stitch called back-stitch. This is just ordinary running, except that each time the needle is taken out of the material it is put in again exactly where the last stitch ended, as shown in picture 2. These folds together—the box-pleat and the tuck on either side of it—form the front of the corset and make it firm.

At the back a row of buttons and buttonholes are needed to fasten the little stays together—about four will be enough. On each side of the space for the buttons and buttonholes a pleat is made exactly to match those in the front, as picture 9 shows.

The next thing to do is to make the edge neat at the top and bottom. The best way to do this is to bind them by first laying a piece of silk binding, which is like soft tape, just against the edge on the right side, and running them together. Then turn the binding right over the edge, and hem it neatly on the inside.



1. The pattern of the stays

2. Stitching

3. Three ways of sewing on a button

Buttonhole ends

Feather-stitching

9. The garment finished

The little shoulder-straps are made of a strip of the material folded double and stitched like the tucks, and finished in mitre-point — that is, the little corners are turned inside to form a point.

All that now remains to be done is sewing on the buttons and making the buttonholes. Always remember to use buttons a size smaller than the buttonhole, as this prevents it from being stretched and torn. There are many ways of sewing on a button, but the best way, if you have a linen button which is pierced with four holes, is to take the thread through and through to form a cross, as the button marked *a* in picture 3 shows. If you have a button with no holes in it, make a little ring in pencil round the centre of the button, and follow it all round with little back-stitches, putting the needle through at the back and pulling it to the front. This is shown in *b*. The third way of fastening the button, and the strongest, is shewn also in the picture [*c*]. This has two holes with very narrow tape run through and fastened at the back. One piece of tape should thread the whole row of buttons.

The fastening off of the thread when the button is secured in its place is an important matter. First of all, you should never begin to sew on a button by making a knot in the thread, but start by doing two or three small stitches in the material just where you are going to put the button, and then put the needle through both material and button, and back again. Then raise the button a little, bring up the needle and thread

between the material and the button, and wind the cotton a few times round the sewn stitches to form what is called a stem. This will protect the stitches and make the sewing firmer; it will also raise the button from the material and make the buttoning much easier. The needle should then be put again through to the wrong side, a few back-stitches done, and the thread cut off.

Making the buttonholes will be quite easy, because we have already learned the stitch on page 457; but what we have not yet learned is how to finish off the ends. There is more than one way of doing this, and it all depends upon where the buttonhole is to be put. If it comes in the middle of a band, it should be finished off at both ends like picture 4, but when it is intended to fasten two edges together, like the back of our little stays, only one side need be made firm by buttonhole stitches across the end, because it is only the side nearer the edge that the button presses against. See picture 5.

When we made the front of the little stays, we finished off the edges of the box-pleat and the tucks by back-stitching them, did we not? But there is another way, and a prettier one, to do this, and that is by feather-stitching them, which holds them just as firm as the back-stitch, and looks much prettier.

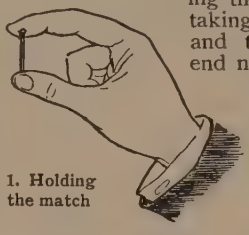
When starting to learn how to do feather-stitching, the best way is to trace a straight line from top to bottom of a piece of canvas, and take up each time the same number of threads on each side all the way down. Thread a crewel-needle with cotton, and bring it up on the line; then hold the cotton under the left-hand thumb, insert the needle at a little distance to the right side, about a quarter of an inch higher than the place where the needle came out, and, pointing it in a slanting direction, bring it up on the line a little below the place it was previously brought out. Pass the point of the needle over the thread held by the thumb, and draw the needle and thread through. Repeat this on the left-hand side.

You will now have a stitch on the right side and one on the left. Now again hold the thread down, and make a slanting stitch on the right side, repeat this on the left side, and go on in this way, making one stitch on the right and one stitch on the left, until you have made the length desired. If this is not clear, look at picture 6, which explains much better than words. The thread must not be drawn too tightly, especially if the work has to be washed, in case the material should shrink.

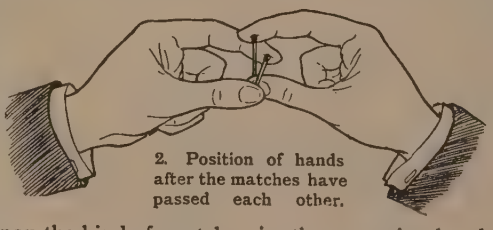
Now, if you want to make fancy feather-stitching, such as shown in pictures 7 and 8, you only have to work two or three stitches, one below the other, on each side of the middle rib, forming double or treble branching.

PULLING ONE MATCH THROUGH ANOTHER

IN this trick the performer takes an ordinary wooden match in each hand, held lengthwise between forefinger and thumb, as in picture 1. He brings his hands together, holding them so that the matches are crosswise to each other. Strange to say, instead of clashing the one against the other when they meet, the one passes right through the other, and the two hands are thereby linked together, each match being now *within* the space enclosed by the match, thumb, and forefinger of the opposite hand. It would seem as though they could not possibly be again separated without dropping one or other of the matches. And yet the performer, by virtue of his magic power, disengages them with the greatest ease, drawing the hands freely apart, quickly or slowly, as may be desired, and re-engages them in like manner, the matches remaining throughout undisturbed between finger and thumb as at first. The trick depends partly upon the kind of match used, and partly upon a little cleverness, which, though by no means difficult, must be practised diligently before the operator ventures to use it in public. This, by the way, applies to all conjuring tricks. The matches used are those known as "white pines vestas," which can be bought from any tobacconist. These are not of the "safety" kind, but have large red heads, into the composition of which a good deal of *glue* enters. The performer prepares for the trick by privately moistening the tip of each forefinger; and, in taking the matches between finger and thumb, he places the "head" end next the moistened forefinger. A little gentle pressure makes the match adhere to the finger strongly enough to carry its own weight. When he brings the hands together, he does so in such a manner that the match in the left hand comes into contact with that in the right, close to the lower, or non-adhesive, end. A slight relaxation of the pressure of the right forefinger lifts the match in that hand away from the thumb in a very minute degree, and allows the match in the opposite hand to pass through the gap thus created. As soon as it has passed, the thumb closes on the end of the match as before. The matches are separated in like manner.



1. Holding the match



2. Position of hands after the matches have passed each other.

A LITTLE GARDEN MONTH BY MONTH

WHAT TO DO IN THE MIDDLE OF MAY

We have already considered the sowing of *annual* plants, and even yet—for it is not too late for autumn flowering to make a last sowing, if necessary—French or African marigolds are suitable, as their bright orange and chestnut-coloured flowers are always beautiful.

But there are other seeds beside those of annuals that must be thought of this month, and sown at once, if we wish to rear plants that will give us plenty of flowers next year. These plants are either perennial or biennial —that is, they flower once a year or once in two years, and all those mentioned here are quite hardy and able to stand the winter without protection. A true biennial takes much longer than an annual to arrive at the flowering stage, but, having flowered, like the annual, it dies.

A perennial continues to flower year after year. Six packets of inexpensive seeds that may be sown at the present time would include Scotch Pinks, Sweet-williams, Hollyhocks, Canterbury Bells, Everlasting Peas, and Larkspur.

If we have no room in our little plot for them at present, we may still rear them in boxes, pans, or pots. The boxes should not be too large, but they should be deep enough to afford sufficient room for the roots of the little seedlings. Holes must be bored in the bottoms, and over these holes we must place bits of broken pots.

It is a good thing to put some cinder-ashes, as large as nuts, all over the bottom, if sufficient bits of broken pots are not at hand, to a depth of an inch or so, in order to allow the water to escape from the soil. The soil itself should be fine, and, unless already sandy, some silver sand or other fine sand should be added to it.

After the seeds are sown, they should be put in some place that does not catch the midday sun, or, if this cannot be managed, some shade must be given. After a time, when the seedlings are well up, they can be planted out wherever we can find room for them. It need not be the place we wish them to flower in; and in the autumn, if we desire it, they can be moved. They might, perhaps, be planted where a crop of cress has been cut.

Sow thinly and plant out thinly—this must never be forgotten. Although only six kinds have been mentioned, there are hundreds of different kinds that can be reared in this way, or sown in the open ground.

In dealing with the seedling plants, we must remember that when it comes to planting out the stocks we may throw away the largest and strongest ones, and plant only the smaller ones, because the big, sturdy specimens will be the most likely to produce single blossoms instead of the fine double rosette-like flowers we hope for.

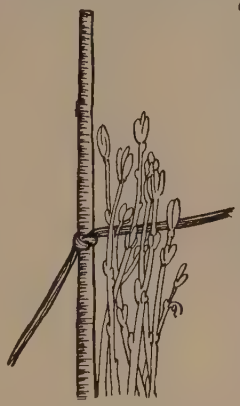
Some seasons are a great deal more forward than others, according to the weather; therefore we must be on the look-out to stake and tie up any plants that show signs of needing it. Once let them grow crooked, or begin to lie along the ground when they should stand upright, and there is little hope of ever tying them up so as to make them look as they should.

This tying and staking is a really important matter, and should be done very carefully. Many people never tie out a plant to the best advantage. Where there are many stems, three or four stakes will be better than one; and some of the stems will be tied to each.

To tie a plant into a tight, thick sheaf is the worst thing possible, both for its appearance and its health. It wants the air to circulate quite freely through it, or it will not produce nearly the number of flowers it might and could do.

For small plants bamboo canes make capital stakes; the stems can be tied out with raffia or, better still, raffia tape. But for tall, heavy plants—that is to say, those that will become tall and heavy before the end of the summer—like the hollyhocks, for instance, strong stakes are necessary, and these must be driven deeply and firmly into the ground. Strong tarred line should be used to tie the plants securely to the stakes, but they must *not* be tied up too tightly or closely.

The stake being driven down, the tying material should first of all be tied to the stake, and then brought forward round the stems of the plant, as by this method there is no fear of the line slipping down. The illustration on this page makes this quite clear. The first tying will have to be followed by a second later on, when the plant shall have made further growth, especially in the case of tall ones.

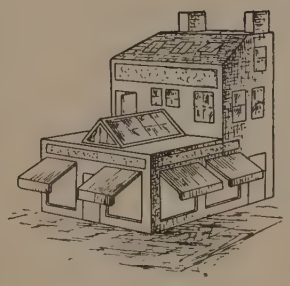


This is how plants are tied up to help them to grow straight

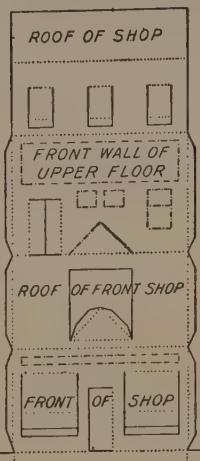
We must remember that we are not tying up our plants solely for fine, still days, but to help them to withstand sudden storms and high winds. Many of them would never need tying at all if the weather were always fine and sunny, but these are often the ones that need it most when rough winds buffet them and heavy rain beats them down.

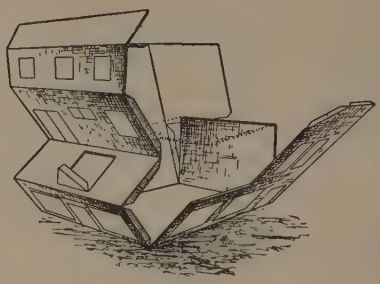
If a sowing of radishes has not yet been made, the seed may be put in at any time. It is best to sow a few seeds at a time, and make three or four sowings, so that they may all be eaten at their best. Radishes should be carefully attended to and watered every day if necessary, as the best and crispest radishes are those that are grown quickly.

PLANS FOR A LARGE SHOP IN MODELTOWN

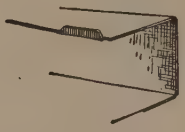


1. The completed shop

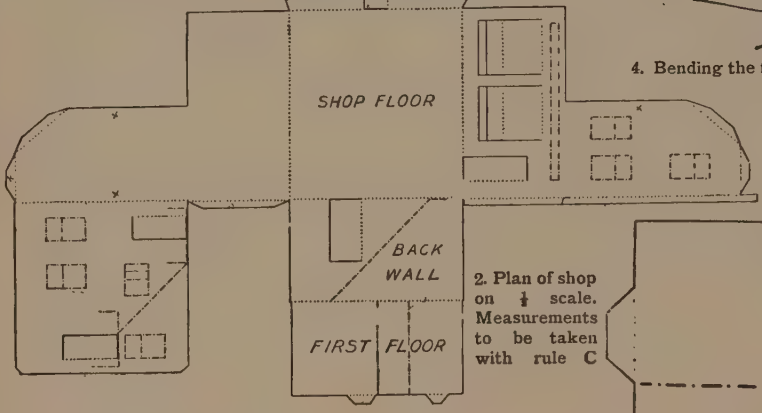




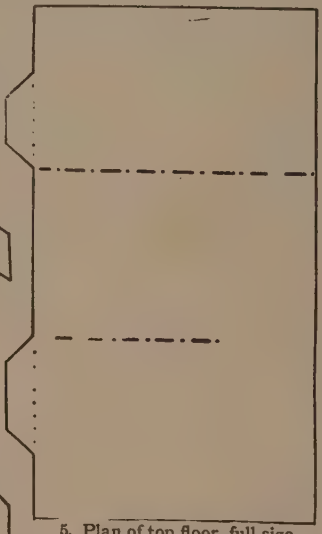
3. Bending the card



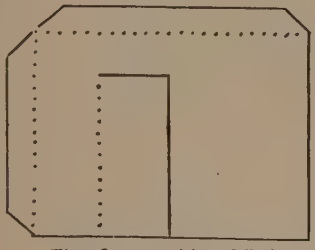
4. Bending the first floor



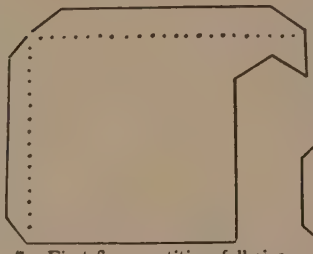
2. Plan of shop on $\frac{1}{4}$ scale. Measurements to be taken with rule C



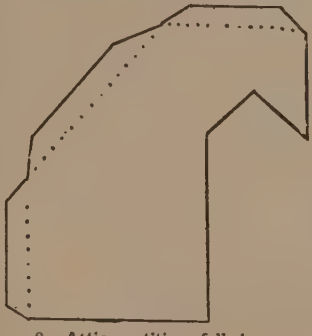
5. Plan of top floor, full size



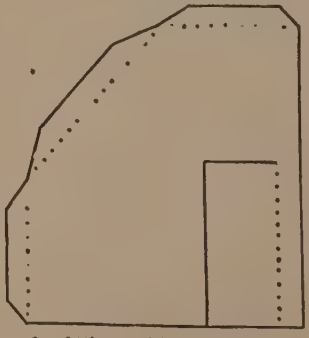
6. First-floor partition, full size



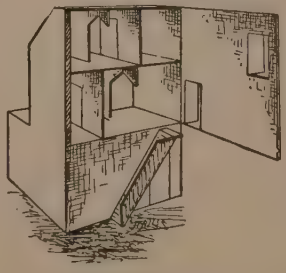
7. First-floor partition, full size



8. Attic partition, full size



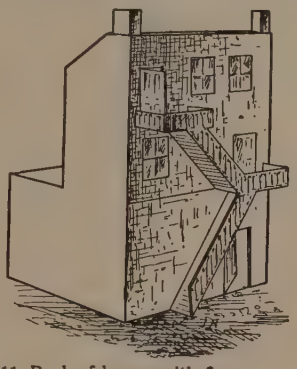
9. Attic partition, full size



10. Back of the house open

A LARGE SHOP FOR MODELTOWN

It is to be hoped that we did not find too difficult the work of making the cottages and shops that we have erected in Modeltown. They were really not so difficult as those we are now going to make, but with care and patience those we are now about to make are well within our skill. We shall make a larger shop than those we have already built. Small shops are very well for a small village, but as the village gives evidence of growth that will make it an important town, large shops begin to rise. Some shops, also, need much more room than others. A furniture shop, for instance, is usually bigger than a baker's shop, because the tables and sideboards take up much more room than do the loaves and cakes. So we shall make a larger shop, and let it serve for a cabinetmaker or any other kind of shopkeeper who needs a good deal of room.

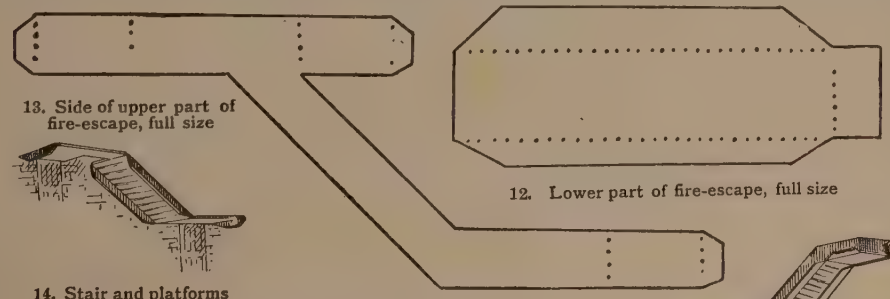


11. Back of house, with fire-escape

The shop we are about to make is shown in picture 1, and if we refer to this as we go along it will help the building operations very much. Picture 2 is the plan of the frame of our shop. It is drawn to one-third scale, so in making the drawing on our card we must use rule C to take the measurements and make our drawing with the full-sized rule.

We have already seen, on page 446 and elsewhere, the meaning of the different kinds of lines in our plans, so we need not go over these particulars again. Having made the drawing and cut out the card in the usual way, we bend up the card as shown in picture 3. This picture shows by dotted lines the end part that folds up to make the floor of the upstairs, so as to give a better view of all the parts. This part is shown in solid lines in picture 4. Having folded up the card to make the frame of the house, we glue the edge slips where they go behind the walls and so make it strong and rigid. The turned-up edge of the first floor must be glued to the inside of the high front wall.

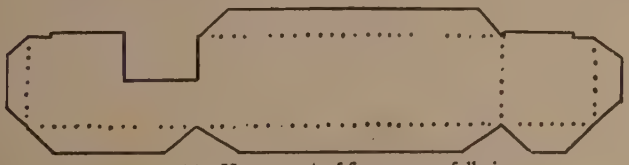
At the four crosses on the plan we make pinholes in the walls, and glue inside the walls at these places slips of wood, such as wooden matches without their heads, so that they may support the top floor. We have done this work before, so that it will not be at all difficult. We must now draw and cut out of cardboard the plan of the second floor as shown in picture 5, and the partitions in pictures 6, 7, 8, and 9, making all these the same size as the pictures—that is, using the full-sized rule both for taking the measurements and for marking the sizes on the card. Picture 10 shows how the top floor and the four partitions are to be placed. Those with the slant go into the attics at the very top and the other two into the floor below it. We must glue all these carefully into place. We find that the back wall of the building hinges open, except the part on the ground floor, and we shall find this very convenient when we furnish the upstairs rooms. We will add a very necessary provision for tall buildings—a fire-escape. If we look at picture 11, we see the fire-escape attached to the back wall. As the upper part of the back of the house hinges open, we must make the escape in two parts. First we draw and cut out a card to the shape of picture 12, which is a full-sized drawing. We attach this stairway to the lower part of the back wall, as shown in picture 10. Now we draw and cut out the plans in pictures 13 and 15, making the drawings the same size as the plans. Picture 15 is the upper stairway with the top and the intermediate landing, and



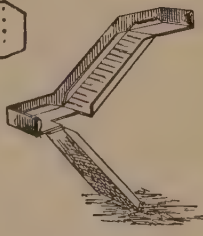
13. Side of upper part of fire-escape, full size

12. Lower part of fire-escape, full size

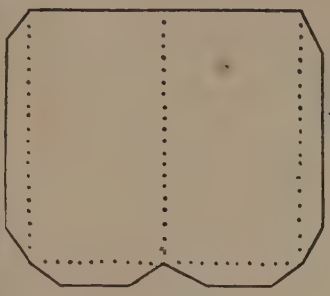
14. Stair and platforms



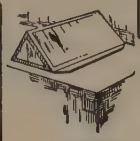
15. Upper part of fire-escape, full size



16. Stair with railing



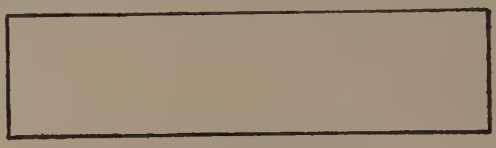
17. Plan of skylight, full size



18. Skylight

19. Chimney, full size

20. Chimney, full size



21. Large signboard, full size

22. Small signboard, full size

picture 13 is the hand-rail that goes right down the side and is attached to the walls and also to the edges of the stairs and landings.

Picture 15 shows the upper part of the fire-escape after it has been attached to the wall, and picture 16 shows how the fire-escape stairs with the hand-rail attached would look if we could see them from within the house itself. It will perhaps be easier to attach the hand-rail to the stairs before we attach the latter to the wall, but so long as we cut everything out neatly, and glue the pieces into position firmly and correctly, this is not important. There are lines on the plan in picture 2 showing exactly where the stair has to be attached, and picture 11 gives a good idea of how the whole fire-escape should look after it has been glued into place. The back of the house is now complete, and we shall now turn to the front of it. First we make and cut out the skylight, the plan of which is given in picture 17. We make it the same size as in the picture. The place where it has to be fitted is indicated in the plan in picture 2, and picture 18 shows how it is attached. We can also see the building with the skylight in position in picture 1.

We have now to make two chimneys, and the plans, which we make the same sizes as the plans on our card, are given in pictures 19 and 20. We have already made and attached chimneys several times, so we know how to do it by this time. There now remain only the signboards, of which we shall want three. We have a big broad one for the front, up near the attic windows. This we cut out to the same size as picture 21, and the plan of two smaller ones, one of which we attach to the front and one to the side of the shop just above the ground-floor windows, are given in picture 22. All the signboards we will make the same size as the picture plans, using only the full-sized rule for taking the measurements and for making the drawings on the card.

The finished shop, made as described in these pages

We see in picture 1 where the signboards are placed. It will be very nice if, before putting up the signboards, we put the lettering on them. We can make the shop any kind of trade we like. Let us have it a furniture shop. So we will put on the broad sign the name of the owners of the shop. We will call them Walnut & Birch, which is a very good name for furniture-makers. Now, upon one of the smaller signs let us print the word Cabinetmakers and on the other House Furnishers. But before gluing on the facias we might paint the building. The sun-blinds we will make striped in green and white, and we will have the glass of the skylight and of the windows a pale blue. The vertical walls of the building we will have red. We can use red ink or red paint, but a better effect will be got by powdering a piece of red brick, and, after painting the walls with weak glue, applying the powder before the glue dries. Indigo or slate-coloured paint will do nicely for the roof.

Our next building in Modeltown will be a villa.

LITTLE PROBLEMS FOR CLEVER PEOPLE

THESE problems are continued from page 582, and the answers below refer to the problems on that page.

WAS IT QUICKER TO CYCLE?

36. James and John are cycling from Liverpool to a village 20 miles distant, and when they have gone only 4 miles John's machine breaks down. They wish to reach their destination at the same time. They can both walk or they can use the cycle alternately. They can walk 4 miles an hour and cycle 8 miles an hour. Which is the quicker way?

WHICH ROAD DID CHARLIE TAKE?

37. Charlie started from his home intending to cycle to a village 10 miles away. He came to cross-roads and found that the signpost had been pulled up and lay in the middle of the road. Yet he made the signpost tell him which was the proper way to go. How did he do it?

How did Charlie know the way?

HOW LONG WERE THE CANDLES?

38. I had two candles, one of them an inch longer than the other. I lit the longer at 4.30 and the shorter at 6. At 8.30 they were both the same length. The first burnt out at 10.30 and the second at 10 o'clock.

How long were they before I lit them?

WHEN WILL HARRY HAVE A CYCLE?

39. Harry, aged 12, has been promised a bicycle when he is one-third the age of his father, who is now 56 years old.

When will Harry get the bicycle?

HOW LONG WAS THE TELEGRAM?

40. A man sent a telegram from New York to Albany. If he had sent it to London it would have cost him 25c. a word, and the total cost would have been $1.25 more than he paid. How long was the telegram?

HOW MUCH WATER WAS SPILT?

41. A boat leaving a wreck had water to last 13 days, allowing each man one quart each day. After 5 days some water was spilt, and one man died on the same day. The water then lasted just the expected time. How much water was spilt?

HOW MANY TRAINS?

42. A train leaves New York for San Francisco every morning at 9 o'clock, and another leaves San Francisco for New York every morning also at 9 o'clock. Each train takes exactly five days to make the journey across the continent.

If I travel in one of these trains, how many trains shall I pass coming in the opposite direction?

WHICH FARM WAS THE BIGGER?

43. A farmer in Canada boasted that he had a farm of 4 square miles. Another farmer, who heard him, said: "My farm is bigger than yours. It is 3 miles square." Was the second farm really the bigger?

WHICH IS THE HEAVIER?

44. "Which is the heavier," asked Herbert, "an ounce of gold or an ounce of feathers?" "An ounce of gold, of course," replied his sister Maud. "But a pound of feathers is heavier than a pound of gold," said Herbert.

Was he right?

THE ANSWERS TO THE PROBLEMS ON PAGE 582

30. The train passed me—that is, travelled its own length—in 9 seconds, and it travelled its own length and 88 yards in 21 seconds. Therefore, it went 88 yards in 12 seconds, and, seeing that it travelled its own length in 9 seconds, its length is three-quarters of 88 yards—that is, 66 yards.

31. In another 3 years Tommy will be 6 years older than he was 3 years ago. If his age is then 3 times what it was 3 years ago, 6 years must be twice his age 3 years ago, so that he was 3 years old 3 years ago, and he is 6 years old now.

32. With no current Duncan would go three-quarters of a mile in one quarter of an hour—that is, 3 miles an hour; but he actually goes only at the rate of 1½ miles per hour, and the difference between 3 miles and 1½ miles is the speed of the current, which is, therefore, 1½ miles an hour.

33. Ten miles an hour is 1 mile in 6 minutes, so that if the farmer had gone home by the road he took on the outward journey he would have saved 24 minutes instead of 12 minutes. Eight miles an hour is a mile in 7½ minutes, and at 10 miles an hour he therefore saves 1½ minutes in each mile. As the saving in time would have been 24 minutes (which is 16 times 1½ minutes) by the shorter route, it must have been 16 miles. Thus the outward journey was 16 miles long, and the homeward journey was 18 miles.

34. The whole sum was in 4s. pieces.

35. When the first party of men met the second party they had used one day's food, and the remainder would have lasted them 4 days more, but as the addition to the party curtailed the period by one day, the new men must have eaten as much in 3 days as the 9 men ate in one day. But 3 men would eat as much in 3 days as 9 men eat in 1 day. Hence there were 3 men in the second party.

MORE GAMES TO PLAY OUT OF DOORS

HERE are some more games for boys and girls to play out of doors. Some can be played on the lawn; others are more suited to the playground.

TUG OF WAR

A STRONG, long rope is laid on the ground across a chalk line. The players are then divided into two parties, one side taking up the rope on one side of the line and the other the opposite side. At a given signal they pull against each other with might and main, and the side that draws the enemy over the line are the victors.

LEAP-FROG

THE frog bends down with his hands on his knees and his back up. The leaper runs toward him, places both hands on the bent back, and, spreading out his legs, passes over, to come down on his feet the other side. Running a short distance, he bends in turn, and he who has lately been frog goes over him in the same way. If a number of boys be playing it becomes very warm fun, for as each one goes over he runs and bends, so that there are many backs to leap before a turn comes to stoop.

A SACK RACE

IN this race each runner puts his feet into a large sack, and draws the top of it together round his body, where it is tied with string. Before beginning to run it is best to push your feet well into the opposite corners of the sack, so as to have as long a step as possible, and not to try to go too fast. If you go fast you may fall, and it is not at all easy to get on your feet again once you are down.

FIELD GOLF

WE are going to play golf in a new way, which is quite simple, but very good fun. Choose a starting-point in a large field and dig there a very small hole. One hundred steps away, in a straight line from this, we make another hole in the ground. Then, at the end of another hundred steps, another hole, and so on until we have gone round the field and are back at the starting-point. These holes mark our golf-course. Each player is armed with a club-ended stick and a small, hard indiarubber ball. The game is to strike these balls round the course, knocking them into each hole as it is reached, and the one who does this and gets round to the starting-point with the fewest strokes wins. Each player, of course, only hits his own ball. The starting-place should also be used as the last hole.

TIP-CAT

THE tip-cat is a short piece of wood, sharpened like a lead pencil at both ends. It is placed on the ground in the middle of a large circle, and the first player strikes one end sharply with a stick. As it leaps into the air he strikes again, and if he succeeds in driving it to a distance he follows it up and continues to "tip" it till he misses, when the next player carries it back to the circle and takes *his* turn. The one who makes the most "tips" without a miss wins the score.

TOM TIDDLER'S GROUND

TOM TIDDLER'S GROUND is marked off with a chalk line, and should be nearly half the playground. The boy chosen for Tom Tiddler takes his stand on it to protect his gold and silver, and he must never cross the chalk line. Presently some of the other players rush over the boundary, crying, "I'm on Tom Tiddler's Ground, picking up gold and silver." Any boy that Tom can touch before he escapes should be made to hand over a forfeit, or stay as a prisoner. On the other hand, if Tom chases him beyond the line, and another player enters the ground before Tom gets back, the new-comer may take his place, and becomes Tom Tiddler.

STEEPLECHASE

THIS is hard work as well as good play. Before starting, a certain point is fixed upon at some distance, with fences and ditches and hedges and brooks in between. Then the word "Off!" is given, and the players race away to see who can get there first. In such a race it is not certain that the fastest runner will win, for the boy who knows how to get over a difficulty stands a good chance.

THE TRAVELLER AND THE WOLVES

THE smallest boy or the slowest runner is the traveller, and the traveller has to get to his journey's end without being caught. The rest of the players are the wolves. Before setting out on his journey, the traveller is given as many tennis-balls as there are wolves, and, of course, there should not be more than four or five, or he will have too much to carry.

When he has got some distance away, the wolves roar out that they are coming, and the race begins. When the traveller finds a wolf overtaking him, he throws out one of the balls, which the wolf must secure before he can take up the race again. Of course, the traveller's object should be to throw the ball in a way that will lead the wolf from the direct path. Thus, he should never throw it in front, or the swifter runner will pass him to secure it, and then merely wait for him to come up. Knowing what the traveller is going to do, the wolves will probably spread out a little to either side in the hope of stopping the balls more quickly. Therefore, the traveller should do his best to find out where the nearest wolf is, and the more skill he shows in managing the balls the greater will be his chance of escape. Above all, he should not throw them away too soon.

If the chances against him are very great at the start, he might be provided with more balls than there are wolves. Of course, a distant spot should be chosen as a goal.

THE NEXT THINGS TO MAKE AND TO DO BEGIN ON PAGE 829.

WHAT OUR LESSONS TEACH US

IN this section of our Book of School Lessons, we shall learn more of the little words of three letters, and the figures which stand for the numbers from zero to nine. Another primary reading lesson is given, each one being a little more difficult than the last. In the Music Lesson we read about the road that the fairies travel on. Tom and Nora learn to write more letters, and our drawing lessons have advanced so far that we are now ready to draw and paint leaves and twigs, and even blossoms.

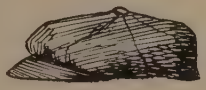
CONTINUED FROM PAGE 495

WORD-BUILDING

HOW TO LEARN LITTLE WORDS

CAN we say now that we know our A B C, do you think? We must try to learn it perfectly, so as to be able to know any letter whenever we see it. In our last lesson we learnt a few words of two letters each, and a few more of three letters each. Perhaps, before we go on to words of four letters, we had better be sure about the three-letter words. Here are a few more of them.

A P spells AP, which is not a word at all; but if we put a C, or an M, or a T in front of it in turn, we get real words.

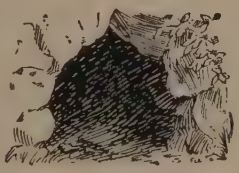


CAP

MAP

TAP

E N spells EN, and if we put first a D, or an H, or an M in front, we get DEN, HEN and MEN.

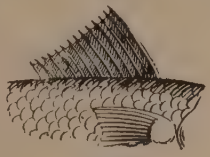


DEN

HEN

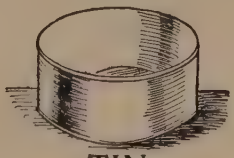
MEN

I N spells IN; put an F, or a P, or a T in front, and what do you find? Why, FIN, PIN and TIN.



FIN

PIN



TIN

One more. U G spells UG, and with an M, or a P, or an R in front, we have these very different words — MUG, PUG and RUG.

MUG

PUG

RUG

Or perhaps you can learn words better in this way:

When boys and girls are fast asleep,
And beasts go out to prowl,
If you're awake, you'll often hear
The hooting of an OWL.

OWL

If father would give me a penny,
I would soon be inside of this shop:
It's the jolliest window of any,
And oh, how I *should* like that TOP!

TOP

COW

This is how
We draw a COW.

BOY—TOY

If you want to give joy
To a poor little BOY,
Just give him a TOY.
You have many;
Although you have a lot,
There are boys who have not:
In fact, there are some without any.

SUN

What is it makes the day-light when
The night is past and done?
We know it is the S U N,
And S U N spells Sun.

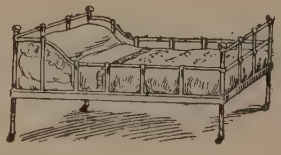
CAR

If you live in a town,
And you want to go down
To see where the toy-shops are;
If you take my advice,
You won't stop to think twice,
But will jump on the very first CAR.

Two and two are four.

$$\begin{array}{r} 2 \\ 2 \\ \hline 4 \end{array}$$

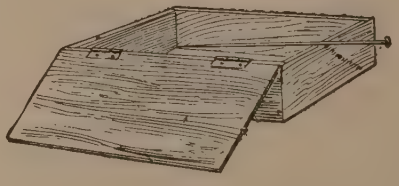
When you begin to add and count,
And to arithmetic you come;
The first thing you will have to learn,
Will be to do this little SUM.



BED

"Oh, mother, just a minute more!"
Poor Willie always said
Whenever night-time came, and he
Was ordered off to BED.

A HEN AND A COW ARE IN THE FIELD



THE PIN IS TOO LONG FOR THE BOX

PRIMARY READING LESSON

Hark, hark,
The dogs do bark ,
Beggars are coming to
town;
Some in rags,
Some in jags,
And some in velvet
gown.

Hark! Hark! Hark!
Bow-wow-wow!
Hear the dogs!
Bow-wow-wow!
Bow-wow.

Do you see the beggars?
Are you afraid?
Are the dogs afraid?
Will the beggars run
away?

See the beggars!
Bark, dogs!
They are coming to
town.
Bark at the beggars.
Bow-wow-wow!

Oh, no,
They are coming to
town.
Some are coming in rags,
Some are coming in jags,
Some are coming in vel-
vet gown.

ACTION SENTENCES

Play you are a beggar in rags or in jags or in velvet gown.

Play you hear a dog bark.

Play you come to town.

What will you do?

THE BEGGARS ARE COMING TO TOWN

TOM AND NORA MAKE MORE LETTERS

"TO-DAY we are going to write something you know quite well," said the children's mother, as they watched her rule lines for them. "Nora, bring me your straw hat—the sailor one."

When Nora brought it she found that Tom had fetched a little dish from the kitchen. Both were put on the table before them, and their mother asked in what way they were alike.

Tom looked a moment, and then said:

"Well, mother, one is china and the other straw. The only way they are alike is in their roundness."

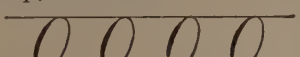
"Yes, Tom," said his mother; "but are they really round like a ball, or a hoop, or that marble in your pocket?"

Tom put the marble on the table, and both he and Nora exclaimed:

"The marble is rounder."

Their mother told them the marble was round, the dish and the hat were *oval*, and that they were going to make a letter like the dish and the hat.

"The letter is o," she said, "and I want you to make it oval, not round, and to start on the right of the curve at the top, like this:



"Notice how my pencil presses heavily on the down curve and lightly on the up curve."

After watching their mother, Tom and Nora took their pencils and wrote a line of o's.

"O's seem easy to make," said Nora, looking at her row, "but it is not easy to make them all alike."

Tom was finding this out too. Some of his o's jostled against one another. Some looked as though they had quarrelled and would not make friends. But the next rows Nora and Tom made were much better, and their mother said that after a little practice they would write them well.

"What is the third letter of the alphabet, Tom?" their mother asked.

"C," said Tom promptly.

Their mother said that now they knew how to make o, there would be no trouble about c.

"Look," she said, c is very much like o in shape, but I begin with a dot, curve up and round to the left, then down, round, and down to the right, and then, instead of taking the pencil up to meet the dot I started with, I pass it up and out to the right."

"Yes," said Nora, "I see, and you make the curve at the bottom of the line bigger than that at the top."

This is how the c's were made:

While Tom was writing his row of c's, he said it seemed to him as though the two ends had joined once, but the join had snapped, and the upper part had sprung back and coiled into a dot.

"Like the spring father showed me in his watch," he added.

"C stands for cousin," their mother said. "C-o-u-s-i-n. Why, you can make all the letters in cousin except s. The next letter to make is the first in the alphabet, and you can nearly make it already. Let us see what it is like."

As their mother wrote rows of a's for Tom and Nora, they watched her closely, and before she had made many Nora exclaimed:

"Why, mother, you are making o!"

"Yes," she replied, "and what else?"

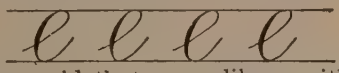
"A pot-hanger," exclaimed Tom.

"So it is," said Nora, "and the two are joined up close together."

Their mother showed them how, after making the o, she kept the pencil on the paper, and made the pot-hanger down the side of the o without lifting the pencil, like this:

"There is one other sister-letter to o, c, and a yet to make, something like c; it is e."

Then they were shown how e, instead of beginning with a dot, made a loop, starting outside and below the middle of the curve on the left. like this:



Tom said that e was like c, with the curled-up dot pulled out and put round behind its back.

"Next time," said his mother, "we will make r, v, w, x, and s."

0 1 2 3 4 5 6 7 8 9

To-day we are going to learn the *figures* which stand for the numbers. We will count how many children there are in each line; then, at the end of every line, we will write the *name* of the number, and after that the *figure* which we can use instead of the name.

One .. 1
Two .. 2
Three .. 3
Four .. 4
Five .. 5
Six .. 6
Seven .. 7
Eight .. 8
Nine .. 9

When there are no children at all, the number is called *nought*, and the figure which stands for it is 0.

You know we have learned to count as far as *twelve*, and we shall soon go on to much bigger numbers than that. But you must not be afraid that we shall have to learn a new figure for every new number. We should never manage to do that.

As we go on we shall find that those ten figures, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, will be all we shall need. We shall see that the 1 and the 0, written close together like this, 10, stand for *ten*, and that 11 stands for *eleven*, and 12 for *twelve*. But it will perhaps take us a little time to understand *why* the figures are written that way for ten, eleven, and twelve.

Before we talk any more about that, let us do a little more counting, and use figures for writing down the answers, instead of having to spell the names of the different numbers.

Two keys and three keys make how many keys altogether?

2 and 3 make how many? 5

Tom had four pennies, and his father gave him two more; how many had he then?

4 and 2 make how many?

There are nine books on a bookshelf, and we take three of them away; how many will be left?

3 taken from 9 leaves how many?

If I take away another three of the books, how many will be left then?

3 taken from 6 leave how many?

How many threes, then, make nine?

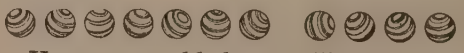
Seven jugs were standing on the table; if three get knocked over, how many are left standing?

3 taken from 7 leave how many?

How many more jugs must be knocked over to make seven altogether?

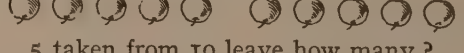
How many added to 3 will make 7?

A boy has seven marbles; how many more must he win to make eleven altogether?



How many added to 7 will make 11?

John had ten apples, and gave five away; how many had he left?



5 taken from 10 leave how many?

So, how many fives make ten?

Next time we shall begin to learn something about the numbers bigger than twelve. We can learn much by counting the cards which we use for playing "Snap," or any other game of that sort. Or, if we have not any cards, we can count pencils or marbles.

THE ROADS THE FAIRIES TRAVEL ON

IN the days of long ago the fairies had much to sing about—beautiful stories for the men and women, boys and girls, who live in this bright, happy world.

When a fairy has told someone of her beautiful secrets, she likes it to be told again and again, because the fairies like us to make one another happy, and if they told you and me a lovely story, they would expect us to take that story to someone else.

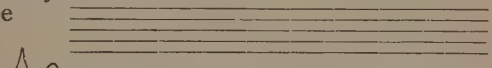
Now, it is one thing to hear a tale, and quite another thing to be able to tell other people about it. First of all, we are living in quite a big world, which contains many countries, and each country has a great many people in it, speaking different languages, and it would be quite impossible for a little boy or girl, or even for a grown-up person, to whisper the fairies' secret in everyone's ear. Happily for us, long, long years ago a great discovery was made—the Fairies' Map was found, and everybody set to work to understand it. That is what you and I are going to do, because we want to know all the beautiful stories the fairies have told, as well as the many new tales they may have in store for us.

The Fairies' Treble Road

We will begin by taking another look at our magic kingdom—the piano, and we will go at once to Fairy C's house, which is in the middle of the long black and white line. We shall find she is at home, waiting for us, because she has something very important to tell. She says that this house of hers is the meeting-point of two roads. That part of the black and white line on her left-hand side is called *the Bass Road*, and the part of the black and white line on her right-hand side bears the name *Treble Road*. We must try to remember these names, because when we want to know what the fairies have said, they let us know which of these two roads we are to find, and which house in that particular road we are to visit.

The Fairies' Bass Road

First, they draw five straight lines, just like this:



These are the fairy motor-lines for the fairy motor-cars, and both fairies and goblins have a very special name for them. They call them *a staff*, and each road has its own staff. The fairies know we might easily lose our way, so as they are kind little people they have sent us two small guides—one is a little fairy girl and the other a little fairy boy. The fairy girl is Fairy G's godchild, and the fairy boy has Fairy F for a godmother. Fairy G's little god-daughter carries a banner of curious design, just like this: , and Fairy F has given her godson a banner with this strange device:

Directly the little guides are called, they come and take up their position at the entrance of their own "staff," so that they may show us the way. Fairy G calls her little helper *Treble Clef*, and she has to stand at the entrance of the road which bears her name. Look at the picture above.

Fairy F's little helper is called *Bass Clef*, and he is on duty in the road which is named after him. There is a picture of him on this page.

To-day we just want to amuse ourselves with the fairy motor-lines, and I think we shall like drawing them.

We must also remember the two roads in our fairy kingdom. First, the road running to the right of Fairy C's central house, called *the Treble*, because little "Treble Clef" stands at the entrance to guide us. Second, the road which lies to the left of Fairy C's central house, and is called *the Bass*, because little "Bass Clef" is waiting at the entrance. Next time we will find out where each fairy stops her motor-car.

PICTURES OF LEAVES AND TWIGS

HAVE you ever noticed that the trees begin to alter and look spring-like in the early days of the year, long before the green leaves come? Every little twig bears a bud that grows bigger every day, and the twigs and buds on each kind of tree are quite different from one another. We should be able to draw these twigs and buds so well that people will see at once whether we are drawing an oak twig, or a chestnut twig, or whatever twig we have chosen.

Can you get some from different trees to-day and try? If you cannot manage to find any twigs, perhaps you can get some flowers and leaves—snowdrops and ivy leaves. We will learn how to draw each of these things, beginning with the twigs.

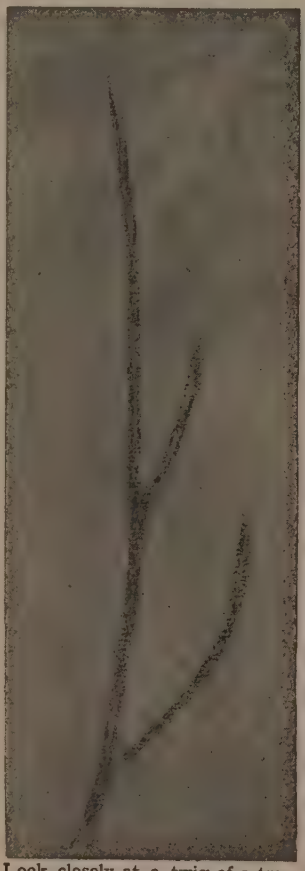
Have your paint-box and brushes ready, quite clean, and a jar of clean water. Pin a sheet of brown paper on your board, and have a sheet of white paper near, as you will want it afterwards. We shall want black and white chalk, and two pencils, one with a fine point and one sharpened flat, like the edge of a chisel.

If you do not know the name of the tree from which you have taken your twig, ask someone to tell you. Now put the twig beside you on the table, on the *left-hand* side of your board, and if you can sit with the light coming from a window on the left-hand side too, it will be much better for you than having the light come from the front or from the right-hand side.

Take a good look at the twig; notice how it curves or turns, first to one side, then to the other. Take your black chalk and draw the longest piece first. It is thickest at the end where it was broken off from the tree. Draw the twigs branching from it next—if there are any—and then the buds.

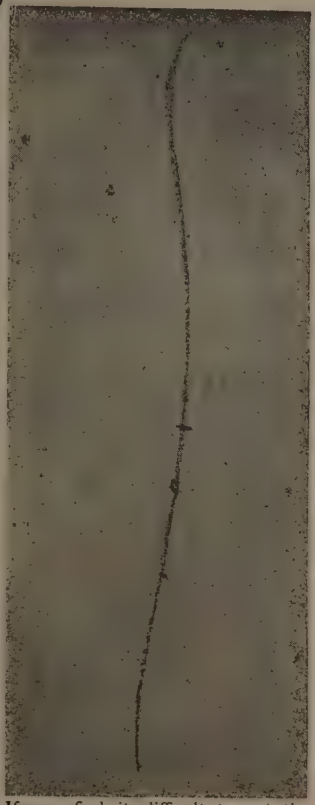
One thing is very important, and we must show it on our drawing. It is this: the stem grows thicker wherever a smaller branch or bud starts from it. This is because the food on which the buds feed all the winter is stored there. Without that little storehouse they could not grow, so be careful to thicken your twigs in the proper places.

If you find it very difficult to get all the little branches right at first, you may put the twig on the paper, and mark, with a little dot, the place where each one comes. But we should not do this often, as it is rather



Look closely at a twig of a tree, and draw on brown paper, with black chalk, first the stem and then the little pieces branching off from it.

Notice how the stem grows thicker wherever a branch starts from it, and show this in the drawing by thickening the line in these places.



If you find it difficult to get the branches in the right places, put little marks where they should begin and end, before you start to draw.

Draw the little branches, beginning at the stem and ending at the point where the bud is. Now we are ready for our white paper and paints.

Paint the twig at once this time, without any outline. Make the stem brown and then paint in the buds, remembering to paint downwards.

a baby way. I hope the drawing is large enough. Measure it and see by putting the twig you have copied on the top of your drawing. Do it again if it is too small, for it is a very bad fault to draw things too small. Now get the white paper, and mix some colours to match the shade of the stem; the buds will want a different colour.

If the stem is grey, mix together light red, cobalt blue, and yellow ochre. A bluish grey will want most blue paint; a greenish grey will only want a little red. Do not put out too much colour if you have tube paints, as you will only want a little.

If the stem is brown, use sepia or Vandyke brown. Try your paints carefully till you get the exact shade, and after you have painted the stalk you must get the exact colour of the buds and put them in.

In drawing snowdrops use white chalk for the flowers and black for the stalks. Paint the flower and stalk in Chinese white, and then paint in the stalk green.

Paint straight away with the brush, holding it rather upright, but do not make a pencil outline first. Always paint downwards, not upwards. If you have snowdrops instead of twigs, use white chalk on brown paper for the flowers and black chalk for the stalks. If you have leaves, put the shapes in in black chalk, without making an outline first.

The snowdrops must be painted with Chinese white on brown paper. Paint flower and stalk in white first; then, when the paint is dry, paint the stalk green, over the white. Lemon yellow and cobalt blue, with a very little light red, make a good green. The ivy leaf must be painted in green

Paint the ivy leaf on white paper with green paint. Make the paper damp and paint downwards, putting on the colour quite flat and smooth.

on white paper. No outline must be made first. Ivy leaves are sometimes dark green and sometimes bright green.

Use Prussian blue, gamboge, and a little light red for bright green. Put Vandyke brown with the blue and gamboge, instead of red, for dark green. Let the paper be damp—not too wet—see that it slants a little, and paint downwards. Do not try to shade the leaves; put the colour on quite flat and smooth.

When you have done this, you can, if you like, practise your pencil work by drawing a cobweb like the one you see in the picture. If you have drawn twigs, you can make it hang from them; but if you have drawn flowers or leaves, draw it separately in the corner of the paper, the long lines first meeting in a dot in the centre, and then the little short lines going round. Use the chisel-pointed pencil for the long lines and the other pencil for the short ones.

Remember that it is better to take another sheet of paper and make a fresh drawing if you do not like your work the first time you do it. If you use indiarubber the paper soon gets worn away, and the pencil lines never look well afterwards. Very often, too, the drawing looks dirty where the indiarubber has been used. So try to get the lines right the first time, and if you cannot manage this, try again, making a new line altogether. It is a very bad plan to think it doesn't matter to draw a line carelessly because it is so easy to rub it out. This is really a waste of time. Next time we are going to learn how to draw a jam-jar.

Here is a cobweb between two twigs. Draw these in in pencil.

LITTLE PICTURE-STORIES IN FRENCH

This story is continued from page 495. This part tells us of the arrival of the party at Dover. We must be sure to remember that the first line under the picture is the French, the second gives the English word for the French word above it, and the third line shows how we make up the words into our own language.

Enfin nous sommes en route.
At last we are on way.
At last we are on the way.

Papa et maman lisent les journaux.
Papa and mamma read the papers.
Papa and mamma are reading their papers.

Nous jouons à la poupée.
We play at the doll.
We play with the doll.

Je suis le papa. Jeannette est la maman.
I am the papa. Jenny is the mamma.
I am papa. Jenny is mamma.

Bébé et la poupée sont nos enfants.
Baby and the doll are our children.
Baby and the doll are our children.

Nous les aimons beaucoup.
We them love very much.
We love them very much.

Bébé pleure et fait le méchant.
Baby cries and makes the naughty child.
Baby cries and is tiresome.

Il veut être le papa
He wants to be the papa.
He wants to be papa.

Je lui dis qu'il est trop petit.
I him tell that he is too little.
I tell him that he is too little.

Jeannette le console.
Jenny him comforts.
Jenny comforts him.

Nous sommes fatigués de jouer.
We are tired of to play.
We are tired of playing.

Bébé dit qu'il a faim.
Baby says that he has hunger.
Baby says he is hungry.

Nous avons tous faim.
We have all hunger.
We are all hungry.

Maman nous donne des pommes.
Mamma us gives some apples.
Mamma gives us some apples.

Toutes les pommes sont rouges.
All the apples are red.
All the apples are red.

Elles viennent de notre jardin.
They come from our garden.
They grew in our garden

Bébé laisse tomber la sienne.
Baby lets fall his.
Baby lets his fall.

Il recommence à pleurer.
He begins again to cry.
He begins to cry again.

Papa se baisse pour la chercher.
Papa himself stoops in order it to find.
Papa stoops in order to find it.

Papa donne la pomme à bébé.
Papa gives the apple to baby.
Papa gives the apple to baby.

Le train s'arrête.
The train itself stops.
The train stops.

Papa perd ses lunettes.
Papa loses his spectacles.
Papa loses his spectacles.

Maman les ramasse.
Mamma them picks up.
Mamma picks them up.

Nous sommes à Douvres.
We are at Dover.
We are at Dover.

Nous descendons du train.
We get down from the train.
We get out of the train.

The next School Lessons begin on page 965.

THE LIGHT THAT SHINES OVER THE SEA

At night, when the moon and the stars are hid, the sailor's way at sea is dark and often dangerous. We cannot put lamps at sea as we do in the streets, but in dangerous places, where a ship might dash on the rocks, great lighthouses are built, from the tops of which huge lanterns throw their light across the waves, warning the captain of the danger that lies near

WHAT THIS STORY TELLS US

IN this story we shall learn how a lighthouse is built in the bed of the sea, so strong that the angry waves which dash around it do it no harm, and the sailors can see its light for many miles. We shall see how a horse's shoe is made to protect its feet from contact with the hard earth and pavements, and how the blacksmith fits it exactly to the horse's hoof; how the trees, which are the most beautiful things in the world, are made into many of the most useful things in the world; and we shall take a peep into two of the great workshops of England.

HOW A LIGHTHOUSE IS BUILT

CONTINUED FROM 698

ONE of the most wonderful things to think of is the way in which men have been able to make light when darkness creeps over the world. A great city lit up at night is a beautiful sight to look upon. Have you thought, when you have been in the dark, how difficult it must be for the sailor to find his way at sea when the moon is not shining and the stars have shut their eyes? We cannot put lamps everywhere in the sea as we do in the streets, yet there are dangerous rocks which would wreck a ship if the captain did not see them. On these rocks, then, and at dangerous parts of the sea coasts, men build lighthouses, with lanterns that throw a great light over the dark water, to help the sailor to find his way and keep his ship out of danger.

THE LONELY OLD MAN ON CAPE MATAPAN

One dark night, many years ago, a ship was sailing on the sea near the coast of Greece. It was so dark that the captain could not see how to guide the vessel, so he made up his mind to stay until morning brought the light to let him see where to steer.

Soon after he had stopped the vessel, someone cried out: "I see a light!" There, far away, was a tiny light, like a dim, distant star, twinkling in the blackness that hung over the sea.

"I know now where we are," said the captain. "We are near the big rocks of Cape Matapan. A kind old man lives there all by himself. When he hears the noise made by the engines of a ship, he knows that the ship is in danger of running on the rocks. So he lights his little lamp and waves it, just as he has done now, to show us where we are."

And now, having got to know where he was, the captain was able to start the ship again, and steer away safely.

There are many places where ships are in danger. There are hidden rocks; there are great cliffs where they may run ashore at night; there are great banks of sand just beneath the water where they may stick fast. The ships have to be guarded from these dangers. But we cannot have men running down to the water's edge with lamps wherever these dangers are. Instead of that, we build great lighthouses, whose light can be seen far over the sea.

BUILDING A HOUSE AMID THE ANGRY WAVES

These lighthouses are built in all sorts of places. Some are on the land; some are built out in the sea on rocks, over which the waves are often sweeping. Others are built on sand. These are hard to build, because, before the foundations can be laid, great piles of timber have to be driven down into the soft sand, so as to make a firm base for the lighthouse.

Men who build lighthouses are so brave and clever that if they could

only keep to their work without being interfered with by the sea they would soon get the work done. But they cannot work for long, because the angry sea will not let them. Once, the men who built a lighthouse could only work for thirty hours in a year! Sometimes a lighthouse takes years to build.

The great Bell Rock lighthouse in Scotland is built on a rock exposed in the cold, rough sea. When the men began to work, only two at a time could be there. There was not room for more. The first thing they had to do was to scrape the thick layers of seaweed off the rock, then drill holes in the rock, so that they could drive in iron rods, and build round these a strong iron platform. This was really only the beginning of the work.

How builders gripped the seaweed while waves passed over them

Every few minutes the waves came dashing over the rock, and the poor men had to lie flat down, grip the seaweed with all their might, and hold their breath until the water had passed over them. Then they would get up again and go on with their work. When the first Eddystone lighthouse was built it took the men four years to make twelve holes in the rock, so that they might build the foundations on which the lighthouse could stand.

When they have got as far as this the work really begins. Heavy tools, machinery, and all sorts of stone and other materials, have to be brought to the spot in ships or boats, and it is hard and dangerous work to get them into the right positions.

One of the most wonderful ways of building a lighthouse was that in which the new lighthouse at Beachy Head was built. There was a lighthouse there on the top of the cliffs, but it was placed too high. Sailors at sea in a fog could not see the light, so a new lighthouse was built at the foot of the cliff, but right in the sea. First of all they had to make a great hole in the chalk under the sea; then, when the tide was low, they built round this hole a big, thick wall, called a dam. They made the dam so big that they could work inside the ring until the tide was very high; then they had to get out.

The men next built in the sea a high platform, made of iron, like a pier at the seaside, only shorter, and very strong. This was their workshop, where they put their things when the tide came in. But up on the top of the cliff they had another workshop, and all sorts of things with which to build.

A railway through the air running into the sea

To bring these things from the top of the cliff down to the sea they made a railway in the air. They had great wire ropes fastened on the top of the cliff and on the platform in the sea, then fastened once more in a bed of concrete set in the sea. These ropes reached from the cliff down to the platform in the sea, and were so strong that a weight of over a hundred tons would not have broken them. Two of these wire ropes made a sort of railway for trucks to glide down, and two more made another railway to carry up other trucks. Then, when one truck carried down its load, it caused the other truck to come up on the other ropes.

In these trucks the men went down to their work, and each truck could carry twelve men out over the sea nearly three hundred yards through the air.

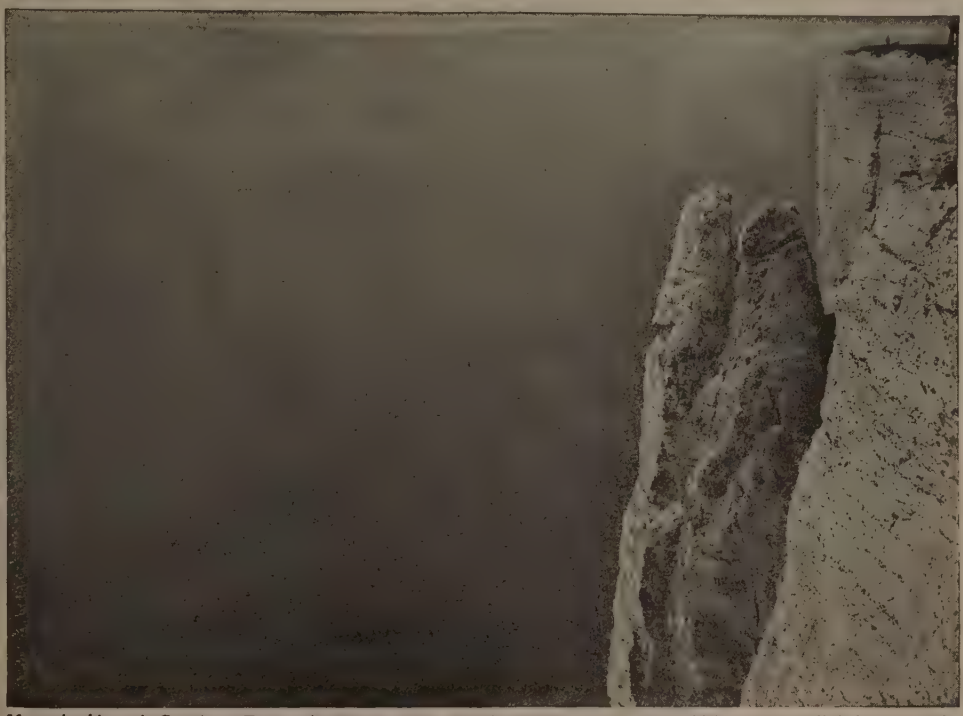
Down this railway they carried all the machinery and all the great blocks of granite that they needed. Some of the blocks of granite weighed as much as four cartloads of coal each, but they were carried down without accident.

Each piece of granite had come from Cornwall, and had been cut so that it would exactly fit into the next. To make quite sure that they fitted properly, they were all built up on land, then numbered and taken to pieces, and put together again in the sea in exactly the same order.

What the inside of the lighthouse is like

This lighthouse is forty-eight feet thick at the bottom, and for a long way up it is a solid granite rock. Then come the eight rooms built inside the lighthouse, one on top of another. First, there is the door by which the men enter and receive their goods. Above these are store-rooms and rooms to live and sleep in; then the room where the men trim the lamps and, on top of all, the room in which the great lantern is kept. The lantern throws its light across the sea and turns round and round, so that it can be seen from any side.

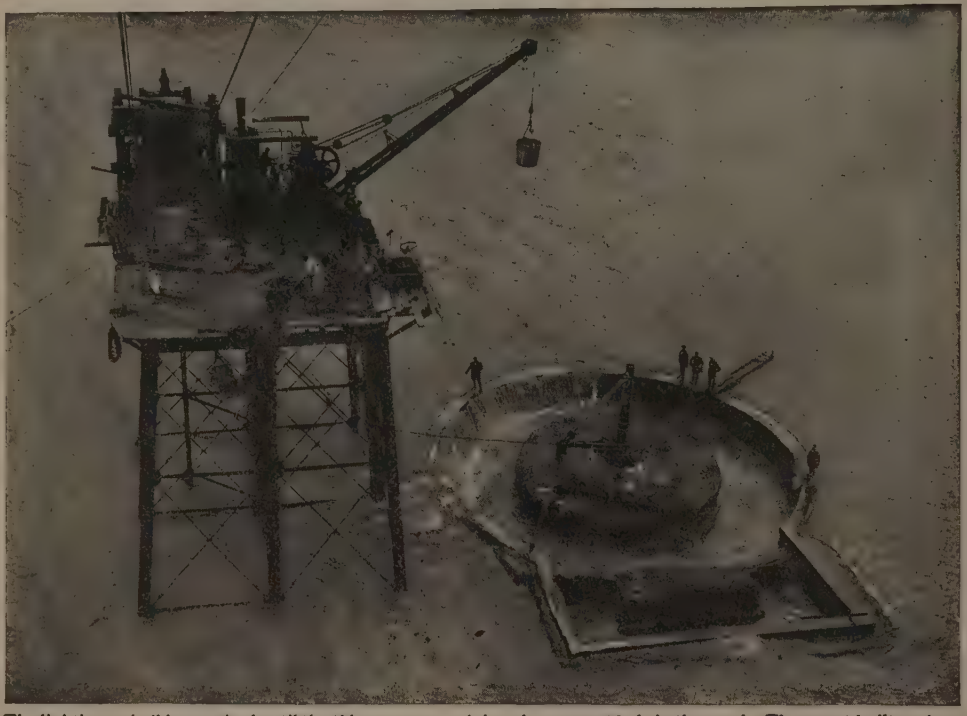
HOW WAS THE LIGHTHOUSE PUT THERE?



If you had been in Southern England at Beachy Head a few years ago, you would have seen a lighthouse on the top of the high cliff there, and, looking down from the cliffs, you would have seen the clear sea, as in this picture.

If you go to Beachy Head now, you will find the sea still beating against the rocks, but rising out of it, with the waves beating all round, is a lighthouse. How did the lighthouse come to be there? The pictures on next page will show you.

A BUILDER'S WORKSHOP IN THE SEA



The lighthouse builders waited until the tide was out, and then dug a great hole in the sand. They next built an iron platform, which they made their workshop when the tide was in. They could then work whether the tide was in or out.

When the tide was out they went on with their digging and building, and round the great hole they built a high wall to keep back the sea when the tide came in. Down below, safe inside the wall, they laid the foundations of the lighthouse.

A LIGHTHOUSE RAILWAY IN THE AIR

But how did the men get down from the cliffs? And how did their stones and tools come there? They made a railway in the air, with wire ropes, strong enough to bear 1,000 men, reaching from the top of the cliffs to the platform in the sea.

Down this railway came big trucks, carrying the workmen and the iron and stone of which the lighthouse was to be made. When the last stone was in its place, the platform and the railway were taken away and the lamp in the new lighthouse was lit. Every night the lantern shines to guide the sailor on his way, and keep his ship off the rocks.

These photographs are taken by Weston, Eastbourne. Continued on p. 799.

THE HISTORY OF CANADA

NOW we begin the story of Canada under English rule. We find that the English were wise enough to give the French inhabitants a great deal of freedom, and that Canada did not rebel when the thirteen Southern Colonies did. During the Revolution, and again during the War of 1812, there was much fighting in Canada, as the British used the country as a base from which to start expeditions. The province of Quebec was divided into Upper and Lower Canada, and some disturbances occurred. Finally, in 1840, the provinces were united, and allowed to govern themselves for the most part.

CANADA AS AN ENGLISH COLONY

CONTINUED FROM 540

JAMES RUSSELL LOWELL once said that the British conquest of Canada made the United States possible. It removed from the thirteen colonies the fear of a northern army which had so long threatened their homes and retarded their commercial progress. It increased the feeling of independence among the English colonists and the feeling that they could do without British troops and British protection. The bonfires which lit the market-places of the chief American cities with rejoicing were the last of their kind and in the capture of the army of Cornwallis at Yorktown, France obtained her revenge for the defeat of Montcalm upon the Plains of Abraham.

NO IMMEDIATE CHANGE IN THE GOVERNMENT

Under the early British rule, the change in the government of New France, or Quebec as it was now called, was very slight. From 1764 to 1774, the military influence was supreme and the power possessed by Lord Amherst, General Murray and Sir Guy Carleton was almost autocratic. In the latter year came the Quebec Act and a general change of the government to meet the conditions which had arisen during the decade of British rule.

THE QUEBEC ACT (1774)

By the terms of this act, the Province of Quebec was defined as extending southward to the Ohio, westward to the Mississippi, northward to the boundaries of the Hudson Bay territory and eastward to the borders of Nova Scotia. All ordinances issued since 1763 were annulled. It was ordered that in all matters relating to property and civil rights, the old laws and customs of Canada should prevail, but in all criminal cases the English criminal law should be established. It was not thought wise to give the colonists a legislative assembly, so only a legislative council was authorised.

This council was to be appointed by the Crown from persons living in the province. It was not to exceed twenty-three nor to have less than seventeen members. Its powers of legislation were limited. The right to levy taxes was withheld with this exception, that the towns of the province might be allowed to tax themselves for purposes of local improvement. To cover the expense of governing the colony, the old French duties were abolished and in their place duties were placed upon spirits and molasses brought into the province. The Roman Catholics were allowed to worship in their usual way and their clergy were allowed to collect the accustomed tithes from members of that church. The Roman Catholics were also excused from taking certain oaths when appointed to public office.

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Therefore, it became possible for the Canadian seigneurs to accept office in the legislative council and a number were at once appointed. As a result the Canadian noblemen remained loyal.

THE AMERICAN REVOLUTION

After the peace of 1763, the arrogance of British officers and the incapacity of British governors soon aroused an antagonism in the American colonies. In nothing was their right of control more jealously guarded than in the matter of taxation. The colonists were in the mood to push their constitutional rights to the utmost limits and the British Parliament was so stupid as to touch them in their tenderest spot. A few American commodities, sent to countries in northern and western Europe, had first to be landed in England; nor could the colonies buy a yard of French silk or a pound of Chinese tea except from British merchants.

Now however the celebrated Stamp Act (1765) was passed, under which such a tax was to be collected in the colonies without the consent of the colonial assemblies. The act was repealed in the following year, but the experiment was repeated in 1769 when an act was passed for the levying of a revenue duty on tea and certain other commodities upon their importation into the colonies.

THE CANADIANS REMAIN LOYAL

The troubles between Great Britain and her colonies did not arouse much interest in Canada. The Canadian French and the Roman Catholic clergy, grateful for the Quebec Act, were all in favour of England. The address of the American colonists to the people of England complained bitterly of the Quebec Act as a concession to the French Catholic population of Canada. So they did not pay any heed to the request of the Continental Congress to join the revolting colonies against the motherland. As soon as war broke out, the seigneurs promptly offered to enroll as volunteers. The Roman Catholic bishop published a letter in favour of British rule. Governor Carleton issued an order calling out the militia and a force was soon collected.

THE INVASION OF CANADA

Soon after the battle of Bunker Hill, Congress determined to invade Canada. Two lines of invasion were adopted by the colonists. Richard Montgomery with two thousand men descended Lake Champlain and captured Montreal while Benedict Arnold with twelve hundred men marched through the forests of Maine and reached Quebec. Later the two commanders joined forces and on the last night of 1775 made a desperate assault upon Quebec. They forced their way into the town but Montgomery was killed, Arnold disabled, and the assault was finally repulsed. The city was kept under a strict blockade. In the early spring General Thomas arrived with reinforcements. Preparations for an active renewal of the siege were in progress when, early in May, Quebec was relieved by the arrival of a British fleet with nine thousand soldiers. General Thomas left the neighbourhood so quickly that his uneaten dinner was found upon his camp tables.

CONGRESS MAKES ANOTHER ATTEMPT TO WIN OVER THE LOYAL FRENCH CANADIANS

The progress of events in Canada aroused much interest in Congress. Washington was anxious that the province should join the revolting colonies. He was afraid that Canada would be made the base for an invasion of New York. Such an invasion, if successful, would divide the colonies. In the spring of 1776, three commissioners were appointed by Congress to go to Montreal to see if they could win the Canadians to their cause. For a time they remained in Montreal and then for their own safety had to return home.

THE AMERICANS DRIVEN FROM CANADA

In a rash attempt to gain lost territory, General Thompson early in June advanced from Sorel against Three Rivers. After landing above the town the American army lost its way, got into a swamp, and in this plight was attacked by the British. General Thompson and about three hundred men were taken prisoners.

YORK, NOW THE CITY OF TORONTO, A HUNDRED YEARS AGO

THE MARITIME PROVINCES

During these years, Nova Scotia made rapid progress. It was governed by a governor and an assembly. During the Revolutionary War, many thousand British subjects who would not join the revolting American colonists settled in the province. This great migration made a readjustment necessary and in 1784 New Brunswick became a province with an assembly and a governor of its own.

PRINCE EDWARD ISLAND

This island was known to the French as the Island of Saint John. When it was ceded to Great Britain in 1763, its population consisted of about thirty Acadian families. In 1767, the island was given in separate grants to a number of friends of the English government. Two years later it was declared a separate province with a governor and an assembly. It was given its present name in 1799 in honour of the Duke of Kent.

UPPER CANADA

Many thousand English soldiers settled along the River St. Lawrence and Lake Ontario. To these first settlers liberal grants of land were made. During the War for American Independence many thousand English loyalists came northward and settled in the Canadian forests beyond the Great Lakes. The people in this part of Quebec, who were nearly all English, were dissatisfied with being ruled by a mixture of French and English law. It was finally decided to divide Quebec into two provinces, giving each a government of its own.

THE CONSTITUTIONAL ACT (1791)

This new measure divided Quebec into the two distinct provinces of Upper and Lower Canada. The boundary line between the two was fixed by royal proclamation and it is still the dividing line between the provinces of Ontario and Quebec.

For each of the new provinces a parliament was provided. It consisted of the Crown, an appointed legislative council and an elective legislative assembly. The Crown was represented in each province by a governor or lieutenant-governor whose assent was necessary to all acts of the provincial legislature.

In addition to the legislative council there was in each province an executive council to advise the governor in the conduct of public affairs. The legislative assembly of Lower Canada was to consist of not less than fifty members and that of Upper Canada of not less than sixteen. Lower Canada remained a French province, while Upper Canada at once introduced the English law as the basis of its legal system.

LOWER CANADA (1791–1812)

The first parliament of Lower Canada met at Quebec on the 17th of December 1792. On account of the difference of race, religion and language one would expect serious problems to arise. For a few years all went smoothly. But with the opening of the new century a struggle began between the English legislative council and the French assembly. Gradually their disputes became more violent, and by 1812 an intense racial hatred existed between the French and the English.

UPPER CANADA (1791–1812)

The first assembly in Upper Canada was called together at Newark (now Niagara) on the 17th of September 1792. Its first act was to establish the English civil law. Later York (now Toronto) was chosen as the capital and parliament met there for the first time in 1797.

During the early years of the province there was little trouble. The people were all loyalists. Their chief interest was the building of homes in the wilderness. Later Radicals came from Scotland, Liberals from England and Republicans from the United States. The new settlers were business men and filled with democratic notions. The two classes soon came into conflict. It was a struggle between the old loyalists and the new reformers.

THE WAR OF 1812

England's refusal to repeal the famous Orders-in-Council, which greatly ham-

pered American commerce, is usually given as the cause of the war. The real causes lay deeper. There was still the old hatred of Revolutionary days. The Americans had still a warm sympathy for France, their old ally in the struggle for independence. There was a longing desire to acquire British America and the strong belief that it would be an easy thing to do in case of war. The American commercial interests were annoyed at the English exercise of the "right of search." This was the right to board neutral ships in search of deserters from the navy.

Detroit captured

Preparations were made for the invasion of Canada. General Hull was to cross the Detroit River General Van Rensselaer to attack Niagara and Commander-in-chief Dearborn to march against Montreal. The Canadians put forth every effort to resist the invading army. Sir Isaac Brock was in command of the forces of Upper Canada. Assisted by the Indians under Tecumseh, he marched against Hull, stationed at Detroit. Before an attack could be made Hull and his entire army surrendered.

The Americans win important naval victory

The first half of the year 1813 was very favourable to the Canadian army. The tide turned in September when Perry won a naval victory over the English fleet under Captain Barclay. This victory on Lake Erie enabled Harrison to enter Canada. He defeated General Proctor and Tecumseh at Moraviantown, where the Indian chief was killed.

The next summer, the Americans attempted to invade Canada by way of Niagara River. Jacob Brown and Winfield Scott crossed the river, fought the battles of Chippewa and Lundy's Lane, but were forced to retreat to American soil. At the same time, the British were defeated at Plattsburg.

The war was very unpopular in many parts of the United States. On Christmas eve, 1814, a treaty was signed at Ghent. All captured territory was restored and the boundaries of Canada were left as they had been before the war.

The family compact

In each province, the government officials and Englishmen of influence formed a small party called a Family Compact to control and govern the province. A strong opposition soon rose against them.

Louis Papineau

In Lower Canada the leader of this opposition was Louis Papineau. He demanded that the permanent officials of the Crown should be free from politics. A bitter struggle followed and Lord Dalhousie, the governor-general, was recalled. Petitions of grievances were sent to England. Parliament appointed a committee to investigate and its report in 1828 did not please Papineau and his party. Efforts at conciliation failed. In the assembly Papineau boldly denounced monarchy and British rule. He commenced to plan for a French Canadian Republic.

William Lyon Mackenzie

Meanwhile a crisis was reached in Upper Canada. The leader was William Lyon Mackenzie, a newspaper editor. For years, he was very popular with the people. In 1830 the moderate reformers under Dr. Ryerson began to refuse to follow his leadership. At the general election of 1834, Mackenzie and his party had control of the assembly. A petition of grievances was sent to England. Mackenzie failed in re-election and his party was defeated. He now deliberately planned a rebellion.

The rebellion of 1837

In Lower Canada the rebellion broke out in October and was quickly suppressed. Papineau fled from the country. The rising in Upper Canada was still more feeble. Mackenzie, too, was forced to flee, but succeeded in reaching the American frontier.

The English government realised that reforms must be made. Lord Durham was sent out as governor-general with full power to restore peace. He made a report which served as the basis of the Act of Union (1840) and responsible government was won.

ENGLAND FROM EDWARD I. TO EDWARD VI

THERE is a famous saying that "uneasy lies the head that wears a crown," and the words are put by Shakespeare into the mouth of Henry IV., one of the kings whose troubled lives come into this story. This story tells us of long struggles for the crown of England. We see that the first care of kings has not always been the welfare of the people, and that rulers have not always sought to make nations happy. These pages tell us of the life of England for 200 years, and in this time many important things happened. The people of Wales were conquered, but the people of Scotland refused to be conquered. There were long wars between England and France, in which gunpowder was used for the first time. All this time the lives of the kings were much troubled, but the nation was growing stronger and greater.

FIGHTING FOR THE CROWN

CONTINUED FROM PAGE 600

WHEN Prince Edward left England, and his old father, Henry III., to go and fight in the Crusade, his young wife, Eleanor, pleaded to go with him. It was in vain that he told her how dangerous the journey was, and how uncomfortable she would be on board ship, or living in a tent. She only answered that "the way to heaven is as near from Palestine as from England." So the Princess Eleanor had her way; and the story goes that she was able to save her husband's life.

A man, sent by the enemy, stole into his tent one hot, stifling day, when he was resting with his heavy armour off. Before the prince realised what was happening, the man, pretending he had a letter to deliver, struck at him with a poisoned dagger. Eleanor rushed forward and sucked the poison out of the wound, and had the joy of seeing her husband recover, after some days of anxious illness. After this they had to journey home again, for Henry was dead, and the prince was now Edward I.

It was Edward who prepared the splendid double tomb of marble for his father, once sparkling with gold and jewels, but now so dusty and grey, close by Edward the Confessor's shrine in Westminster Abbey. He also carried on his father's work by pulling down a piece more of the old Norman Abbey, and building it up again in the new style. Edward made many good laws, and arranged different courts to deal with the various matters of government. He also took good care that real justice should be done, and sent away any judges he found dishonest.

Early in his reign he had bitter fighting with the Welsh. The Britons, as you will remember, had found shelter long before amongst the beautiful hills in the west from both Romans and Saxons; and their children's children defied all attempts to join their land to England.

The English lords who lived on the borderland had great difficulty in preventing the Welsh from carrying off their cattle and whatever else they could find, and followed them, when they could, back to their hills to punish them. There is a little railway now up to the top of Snowdon, and other lines wind about the valleys, and coaches run from place to place. As one travels about these hills, it is easy to understand what fine hiding-places the Welsh had, and how the beauty of the country and the splendid strengthening air made the owners do their best to keep it to themselves.

But Edward was clever and determined, and in the end succeeded in becoming master of the country, so that at last he was able to hang up before the shrine of his namesake, Edward the Confessor, the crown of Llewellyn, the last Welsh prince.

When the nobles came to pay homage to Edward, he promised to give them a prince as ruler, born in Wales, who could neither speak French nor English. He then fetched out to them his little son, born at Carnarvon Castle a few days before! Ever since, the king's eldest son has been Prince of Wales.

HOW EDWARD THE FIRST TRIED TO UNITE ENGLAND AND SCOTLAND

Edward's great wish was to rule over the whole island of Great Britain, as it had been that of Henry II. before him. He wanted the Scottish king to do homage for all his kingdom, but the Scottish steadily refused.

To try to make the kingdoms one by peaceful means, Edward proposed to marry his son to the Maid of Norway, whose mother was the daughter of the Scotch king. But the little girl, Margaret, the last of her family, died on her way across the stormy North Sea. If she had lived, it might have saved much misery during the years that followed, when Scotland was helped by France to resist England, and war was going on in one of the three countries.

Disputes soon arose as to who should rule in Scotland after little Margaret died, and Edward claimed the right of settling them. Naturally, the Scotch did not agree to this, and fought hard to get their own way. During ten years Edward made three campaigns in Scotland. Many of the battles were fought near that narrow part of Scotland between the Forth and Clyde, now so busy with coal-mining and manufactures, and so thickly crossed with railway lines. Stirling in the old time was the key of the road to the Highlands, with its fine castle hill, and the Abbey Craig near by, now crowned with a monument to the great Scotch patriot, William Wallace, who fought Edward and gained a victory over the English in the neighbourhood.

THE QUEEN FROM NORWAY WHOSE MONUMENT STANDS AT CHARING CROSS

The same year that the Maid of Norway died, Edward lost his beloved queen, Eleanor. To mark his grief, and the honour in which he held her, he built crosses wherever her body rested on its way from Nottinghamshire to Westminster Abbey. Three of these are still to be seen. The site of the last is quite near the Abbey. Green fields and a few country houses were its surroundings then; now it lies in the midst of London, where myriads of hurrying feet pass to and fro by the great railway station at Charing Cross. Edward raised a beautiful tomb for his queen at his father's feet. His own, on the other side of his father, is a very plain, large one.

A few feet from where he lies is the ancient coronation chair made by him to enclose the famous stone that he brought from Scotland, on which the kings of that country had been crowned for centuries. Edward's chair was painted and decorated with false jewels when new. Now it looks very dull and worn, but is covered with cloth-of-gold when moved out before the altar for a sovereign of England to be crowned in it. Round the stone run these words, engraved upon it:

If fates go right, where'er this stone is found,
The Scots shall monarchs of that realm be crowned.

We shall see later how and when these words came true, but it was not till Edward I. had laid down his sword for three hundred years.

ROBERT BRUCE, THE HERO-KING OF SCOTLAND, AND THE GREAT FIGHT HE WON

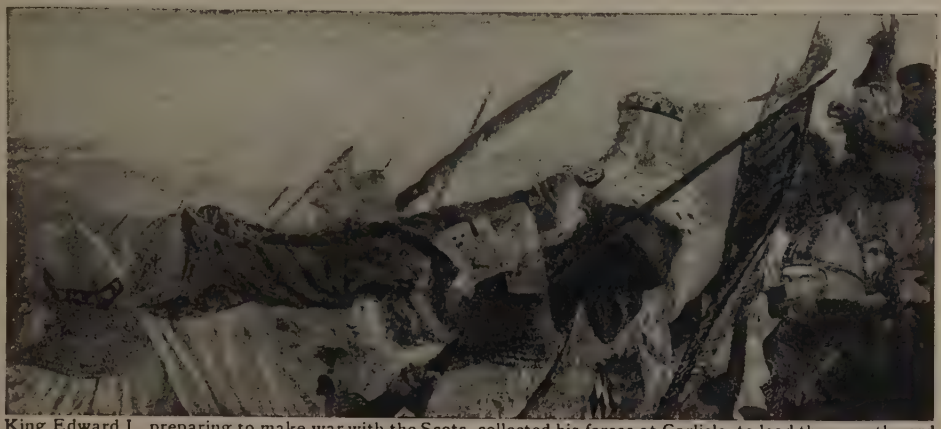
The chief battle in the reign of the son of Edward II. was fought at Bannockburn, within sight of Stirling. It was a wonderful day. Robert Bruce, the hero-king of Scotland, rode up and down on his brown pony—a battle-axe in his hand, a gold crown on his head—encouraging his soldiers, whom he had arranged in the best possible way. Robert had not half as many men as Edward, but before night fell the Scotch were free again; and Edward II. left so much treasure behind that the Scotch became rich as well as free in this one day.

Edward II. ruled so badly that he was made to give up the crown, and his son of fourteen was chosen king in his place. He was Edward III.

A great deal happened during the fifty years of his reign. He began by marrying Philippa when only fifteen.

Her husband was away a great deal, for wars with Scotland and France were incessant. He invaded Scotland again and again, and succeeded to a certain extent, till France helped the Scots. Then troubles broke out in

THREE SCENES IN THE LIVES OF THREE KINGS



King Edward I., preparing to make war with the Scots, collected his forces at Carlisle, to lead them northward. But he fell ill, and at Burgh-upon-Sands, resting by the wayside, just within sight of Scotland, he died.

Piers Gaveston was a great friend of Edward II., the first Prince of Wales, and gained so much influence over him that he was banished. But when Edward became king he sent for his favourite back again.

When Edward III. was carrying on his war with France, he was opposed by Philip, King of France. On reaching the River Somme, he broke through an opposing force, and crossed in time to avoid being captured.

that country, as Edward claimed to be the rightful king of France, through his mother. We must remember the names of some of the great battles that followed. The account of them is to be found in a chronicle written by an Oxford doctor, to be seen amongst the chronicles of England in the British Museum. Every year he wrote down the events as they happened. His name was Adam Murimuth. England's first great sea victory over the French took place at Sluys, and most exciting it must have been. The French king's men found it very hard to tell him what men and ships he had lost.

THE GREAT BATTLE AT CRESSY, WHERE GUNPOWDER WAS FIRST USED

Later followed the great battle of Cressy, in France, fought amidst thunder and lightning and torrents of rain, and an eclipse of the sun. It is said that the English had four cannon with them, and that this was the first time gunpowder was used in battle. If so, the loud noise of the firing would add to the terrors of the day. The arrows of the English fell fast and thick as flakes of snow; the men who came to help the French fell back, and soon all was in confusion. Edward's eldest son —barely sixteen—led in the fight, and won the spurs of a knight that day.

You perhaps know the three feathers, with the German motto below, "I serve," used as a crest by the Prince of Wales? It was this "Black Prince," so called from the colour of his armour, who took this crest to put on his shield at the battle of Cressy. It had belonged to the brave and blind old King of Bohemia, who cried, "I pray and beseech you to lead me so far into the fight that I may strike one good blow with this sword of mine." He was found dead on the field.

HOW QUEEN PHILIPPA SAVED THE SIX BRAVE MEN OF CALAIS

Then for nearly a year Edward tried to take the town of Calais, whose white cliffs can be seen from Kent. Kent has been called the window from which to look out on Europe; and Calais has been called the door into France. Little wooden houses were built all round the town for the soldiers, and no one could pass food through. At last the people were starving, and had to give in to the English.

Edward said that six of the men of Calais must come and give their lives, and then he would let the rest go free. So one after another brave man offered to go, and the six came to Edward with ropes round their necks. Can you fancy how the wives and children of these men felt as they saw them go to the English camp? Edward would not listen at first when asked to spare them, but shouted, "Call the headsman! They of Calais have made so many of my men die that they must die themselves."

Then Queen Philippa herself knelt before the angry king, and, with tears raining down her face, said to him, "Ah, gentle sire, from the day I passed over sea in great danger I have asked you nothing. Now I pray and beseech you, with folded hands, for the love of Christ, to have mercy on them."

The king kept silence for a while, then his heart softened, and he put the ropes of the six citizens into her hands. How happy Philippa must have been, as she cared for them, giving them fresh clothes and a feast, and presents before they went away!

THE MISERY OF THE PEOPLE AND THE HONOUR OF A CAPTIVE KING

But the unhappy war went on. Hundreds and hundreds of soldiers crossed the Channel, to die away from home. Presently it became difficult to find enough men to till the fields, and there was a great deal of poverty and discontent everywhere. A terrible sickness, too, called the Black Death, swept over the country, till nearly half the people died. The rich people did all they could to keep wages low.

The state of France was just as miserable, with land uncultivated and towns in ruins, for people were driven away from their homes, and many of their goods were taken by English soldiers. An old writer said that there was no woman who had not garments, furs, feather beds, and utensils from the spoils brought home by the army.

After the next great battle, Poitiers, the Black Prince took the French king prisoner. The story is told that the captive was mounted on a fine white horse, while the prince rode beside him on a pony, and that he stood respectfully behind his chair at table.

KING RICHARD GIVING UP HIS CROWN

King Richard II. made his people very angry by trying to govern without a Parliament, and at last he was forced to resign his crown to Henry Bolingbroke. In this picture we see Richard giving up his crown and sceptre. He then signed a statement that he was not worthy to be king any longer. This was laid before Parliament on the following day, and the throne was declared vacant and given to Henry Bolingbroke, who became Henry IV.

The king went home to try to collect the enormous sum asked for his ransom, and, being unsuccessful, came back, for he was an honourable man, to end his days in England.

Edward, the Black Prince, died before his father. His tomb is to be seen in Canterbury Cathedral, with his black armour hanging over it. One good thing he did for England was to encourage the woollen trade. He saw that sheep flourished well, and that there was plenty of water to be had, but that people sent away most of the wool to other countries to be made into cloth. So he invited some clever workers to come over the Channel from Flanders —Philippa's country—to settle in the east of England and gather English people round them to learn to make woollen goods as well as they did. This was the beginning of the great woollen trade in Yorkshire.

CHAUCER, THE GREAT POET, AND WYCLIF, THE GREAT REFORMER

We can gain a most interesting sight of these times from an old writer named Froissart, who lived much at Edward and Philippa's Court. The father of English poetry—Chaucer—lived, too, in Edward's reign and that of his successor. You can see his tomb in Poet's Corner in the Abbey. His English is difficult to read, because the language has changed so much since those days, but some of his tales are given on page 437.

Most amusing and delightful pictures of the people does Chaucer draw, and we learn much about the customs of the time from them.

The great reformer Wyclif lived also in this fourteenth century. He has been called the first Protestant, because he dared to protest or speak against what he believed to be wrong. He directed the translation of the whole Bible into English.

You can see this "first complete Bible in the English language" amongst the manuscripts of the Bible in the British Museum, and you will notice that it belonged to Thomas, the youngest son of Edward III. He was the only one of all their children, says Froissart, who was present when Philippa died. Holding the king's hand in hers, she told him her last wishes, asking that "when it should please God to call you hence, you will not choose any other grave than mine, and that you will lie beside me in the Abbey of Westminster." So there they lie, near the Confessor's shrine, Philippa's tomb opposite that of Eleanor, her husband's opposite that of Henry III. It is thought that the faces are portraits.

THE TROUBLED LAND IN WHICH A CHILD WAS KING

Round Edward's tomb were little gilt brass statues of his twelve children, but only six are left. From those of the Black Prince and Lionel Duke of Clarence we can gather the ordinary costume of gentlemen of that day. They wore long outside cloaks, and tight-fitting jackets with belts beneath. It was Lionel who was sent to Ireland to try to bring more of the country under English rule, but he met with but little success. English laws and customs were to be set up round about Dublin, in a district called the English Pale, but beyond that the Irish were to be left to themselves.

The son of the Black Prince, Richard II., followed his grandfather. He was only ten when he came to the throne, and an old poem describing the times quotes the words with sorrow, "Woe to the land when the king is a child."

The great nobles, especially the king's uncles, were always quarrelling, and the peasants who worked on the land could bear their poverty and hardships no longer but at last broke into open revolt, marching to London, breaking into parks, burning and sacking houses. We have in the same poem a pitiful picture of the idleness of the nobles and clergy, and the sufferings and anger of the poor.

RICHARD, THE BOY KING, WHO PLACED HIMSELF AT THE HEAD OF THE MOB

Richard, when a boy of fifteen, showed great courage in meeting a mob of rioters, and placed himself at their head when the leader, Wat Tyler, was struck down. Springing to the front, he cried, "I will be your leader!" But the promises he gave were broken, and the poor folk were none the better off.

Richard did a great deal towards making Ireland more peaceful, but the improvement did not last. He made his own people very angry by trying to govern without Parliament, and at last, after many troubles, he was forced to resign his crown, as Edward II. had

THE MORNING OF THE BATTLE OF AGINCOURT

King Henry V. was very ambitious, and wanted to be King of France as well as of England. He had no real right to rule in France ; but he gathered a large force and crossed the Channel. Though his path was opposed by the French army, he won a great victory at Agincourt, after one of the most famous battles in the history of England. In this picture we see the troops gathered round a priest, who is giving them his blessing.

The Wars of the Roses were one long struggle between the princely Houses of York and Lancaster, who were both struggling for the crown of England. One day, in the Temple Gardens, in London, the heads of the rival Houses met. The Duke of York plucked a white rose, calling upon his followers to do the same. The Duke of Lancaster, boldly fronting him, plucked a red rose; and so the Wars of the Roses got their name.

THE WARS THAT BEGAN IN A ROSE GARDEN

done before him. It was a sad ending to a brilliant beginning. When he was born, his father was a great and powerful soldier and heir to the English throne, and the news of the boy's birth was received with shouts of joy from the soldiers assembled in the Great Hall of the Black Prince at Bordeaux. When Richard died, he had lost all his inheritance and was in prison alone. His tomb in Westminster Abbey is next to his grandfather's.

A distant cousin became king after him—Henry IV. As Henry IV. had no real right to the throne, he was constantly in dread of losing it, and found it very difficult to keep order in England and Wales. Scotland was afraid to do much against him, because their Prince James—afterwards James I.—was a prisoner in England.

When this boy James was about nine years old his father sent him to France to be educated, and to be out of harm's way. His ship fell into the hands of Henry IV., who said, "His father should have sent him to me. I can teach him French as well as the King of France."

PRINCE HAL, WHO STRUCK A JUDGE AND WON A GREAT BATTLE AT AGINCOURT

All the years that the lad spent in England he used for study. He was particularly fond of Chaucer, and later wrote very interesting poetry himself. Henry IV. little thought that James, before he returned to his own land and kingdom, would act as chief mourner at the funeral of his own son, Henry V.

Full of life and mischief was Prince Hal, as he was often called in his father's lifetime, and he got into many scrapes, one of which ended in his being sent to prison for striking a judge. As soon as he became king, his great ambition showed itself: he wanted to be King of France as well as of England. He had no real right to be so, but gathered a large force and crossed the Channel, and in the face of great difficulties won a victory at Agincourt.

One of the old chronicles tells all about it: "Of the trumpets rending the air with tremendous clamour; of the fury of war and deadly spear-thrusts and eager sword-strokes; of the wedges of archers and their piercing arrows; of how that brilliant star of kings, the light and lamp of knighthood (Henry V.), exposed that precious treasure of his person to all the chances of war."

After all this, and more, it was arranged that Henry should marry Katherine, the French princess, and that when the poor, mad old king—her father—died, his son should be passed over, and Henry was to reign with the daughter. Things were in a bad way in France, where there were endless quarrellings among the nobles, and no one to keep them in order, or this arrangement could never have been made.

HOW HENRY DIED AND A BABY KING WAS CROWNED WITH A BRACELET

But all Henry's plans came to a sudden end. He was a good soldier, was wise, and seemed born to do great things; but he died when only thirty-five, leaving a little son of nine months as his heir. There is a picture of this child, crowned and wearing a long mantle embroidered with the arms of England and France. He was crowned on his mother's lap, with her bracelet, it is said, as a crown for his baby head.

Henry died near Paris, a long way from the coast, and the funeral procession went by Rouen at a slow pace in great state, Katherine, a widow at twenty-one, following behind in deep grief.

Then, taking ship, the crossing was made, and the procession formed again, passing along in the same order till Westminster Abbey was reached at last. The poet-king, James I., followed close to the coffin, and Henry's war-horses walked right up the nave, bearing the armour and helmet of the dead hero.

THE BRAVE GIRL WITH A WHITE BANNER, WHO WAS BURNED TO DEATH

Henry VI. had a long reign. First his uncles governed for him, and during this time the English lost what hold they had on France. This was chiefly through the efforts of a young French girl, called Joan of Arc, who was bitterly sorry for the miseries of her country, and longed to drive the English out, and to see her own king upon his throne. So she dressed herself in shining armour, and rode at the head of an army, with a great white banner, cheering on the soldiers and making them brave like herself. At last she succeeded in leading them to

THE ROBBER WHO SAVED A QUEEN

After the battle of Hedgeley Moor, Queen Margaret, the wife of Henry VI., fled with her son into a forest, where she tried to hide. But she was set upon by robbers. While the robbers were quarrelling over her jewels, however, the queen and her boy managed to escape, and, wandering in the forest, they met another robber. He was a brave man, and proved a friend to the sorrowful queen, who gave him charge of the young prince. The robber helped to conceal the queen, and eventually led her to the coast, so that she escaped across the sea.

victory. She was afterwards betrayed into the hands of the English, who cruelly burnt her to death.

All the efforts made to regain France were useless, though the struggle lasted many years. One great misery these wars brought to England was that through them men became trained to be cruel and idle, and to think nothing of taking other people's goods. So, when troubles broke out in England between the nobles, these men were only too ready to join one side or the other, and turn against their own countrymen.

It makes one's heart ache to read of the times of the Wars of the Roses, which now began, and lasted for thirty years. The eleven battles which took place during this time were fought between the king and the nobles, up and down the country—near London, on the line of the old Roman wall, in the beautiful dales of Yorkshire; and all brought bitter woe and suffering to the whole country. These wars were called the Wars of the Roses because those on the side of Henry VI. and the Family of Lancaster chose a red rose for their badge, and those who were for the House of York chose a white one.

The End of the Great War for the Crown of England

In the end, nearly all the great nobles who had begun the war were killed, either in battle or by execution, as first one side and then the other gained the upper hand. At last Henry VI. died miserably in the Tower. The poor man was often out of his mind for many years after Edward IV., of the House of York, first became king.

Henry was too weak to control others and to govern in such troubled times, but he was fond of scholars and teachers and books and pictures of all kinds. He founded the great school at Eton, and King's College, at Cambridge. His wife, Margaret of Anjou, did her best to help him to keep the kingdom, so that their son might have it after him; but the poor lad was killed, and the queen, after being in prison for some time, had to escape from the country and flee to France.

The wife of Edward IV. had many sorrows, too. At one time her husband had to leave England in great haste to avoid being taken by the Red Rose party, and she and her daughters had to leave the Tower, where they were living, and go to a safe refuge at Westminster. Here her eldest son was born.

Caxton, the Man who Learned to Make a Book in a Few Days

About that time, close by the west door of the Abbey, there sat a man earning his living, busy from morning till night. He had learned, while young in Flanders, how to reproduce books in an easier and quicker way than the old way of copying by hand; in fact, how to begin and finish a book in a few days. He brought a printing-press back to Engand, and, setting it up in Westminster, printed many books.

You can see his early efforts in the long King's Library in the British Museum. The thick black letters are hard to read, and it is difficult for us who have more books than we can read to understand the intense interest and pleasure with which Caxton's work was greeted. The king and his family came to watch; the nobles turned over the sheets that poured from his press, to the delight of those who could afford to buy them.

When Edward IV. died, his son of thirteen was the next king, but the boy was never crowned, being hurried off to the Tower by his uncle Richard, who soon managed to get his little brother into his power, too. They both disappeared—it is believed that Richard had them killed in the Tower.

How the King Shocked the People and United the Nobles

He now became king himself, as Richard III., and tried to please the people by calling Parliament together and setting many things in order. He also did a good deal for trade and to make it easy for people to produce books. But all were so horrified at the death of the little princes that they turned against Richard, and in the battle of Bosworth Field, which followed, Richard was killed, and Henry Tudor, of the Family of Lancaster, was made king, as Henry VII.

He married the eldest daughter of Edward IV., and so the two Houses of York and Lancaster were united at last, the red and white roses mingling in one double flower, the Tudor rose.

The next story of England is on page 841

Venice, the city rising out of the sea, as painted by Turner

TWELVE GREAT PAINTERS

CONTINUED FROM PAGE 658

To be a great artist is one of the grandest things in the world. Some pictures bring tears to our eyes by their sadness. Others seem to tell us a fine story, or show us a scene in which everything seems to be alive. Another will show us a portrait of a man who looks so real that we think he is going to speak to us.

And so to-day we can look upon pictures of the world that have been painted by the men who lived in it, as if the artist were still alive, lending us his eyes, through which we might see the things he saw.

Leonardo da Vinci was wiser than most men of his time. As a painter he had a wonderful sense of beauty. He thought out most beautiful things and painted them in a life-like way. He did not only draw lines; he painted his pictures so that we *feel* much more than we *see* when we look at them.

Many great men have tried to teach the world how pictures ought to be painted, but everything that they are able to say was said by Leonardo da Vinci. What he wrote about art is the foundation of the artist's learning. He was one of the most wonderful men who ever lived. He did not only paint pictures and write about them. He was a great engineer and inventor. He travelled all the way from Florence to Egypt to be an engineer there. He invented many wonderful things. All the beautiful Carrara marble from which statues are made to-day is cut with a machine that he invented. He had enough brains for twenty men; but he thought out so much that he could not get nearly all of his great works done. Some of the pictures which he painted are among the greatest in the world, and all the great painters of Italy who came after him made their fame by copying his example.

Who was the greatest painter who ever lived in the world? Some people say Raphael. Others say Titian. At any rate, Titian was one of the greatest. He was the greatest painter in colour that ever lived; and whatever he painted he did splendidly and well, whether it was a portrait, a picture of his fancy, a religious painting, or a thought that he tried to put into colour. His colours are full of meaning.

By the time he was twenty-four his pictures had made him known, not only in Venice, near where he was born in 1477, but all over Europe, and kings paid him great sums of money to visit great cities and paint for them. Although it is so long since his pictures were made, the

colours are as fresh and rich and lovely now as they were then.

So much was he admired that at the Court of Spain, where he lived for many years, the noblemen were jealous of him. "Ah," said the king, "I have many nobles, but only one Titian!" One day the artist, when talking to the king, dropped his pencil, and the king, who was one of the proudest men in Europe, stooped and picked it up, saying that it was an honour to serve so great an artist.

TITIAN'S PICTURE, THE GREATEST TREASURE AT THE COURT OF SPAIN

A terrible fire broke out in the king's palace while Titian was there, and when the king was told of it he asked if they had saved Titian's great picture of Venus, which had been hanging in the palace. They answered that they had saved it. "Then I can bear all my other losses," the king said.

The only man whose fame is as great as Titian's is Raphael, who was born in Italy in 1483, and was alive at the same time as Titian. As a boy Raphael studied under a great painter, but he was soon able to paint so much like his master that now, when we see pictures done by both of them, it is hard to say which is Raphael's and which is by Raphael's master.

The boy was really a greater painter than the man who taught him. Raphael studied all the great painters who had lived before him and copied all their best ideas. He put all these ideas into his own work, and, though he did not think out new subjects for pictures, he painted pictures that seem almost perfect.

The great and beautiful home of the Pope in Rome is called the Vatican, and Raphael did many of the wonderful paintings there. He was an architect, too, and drew the plans from which St. Peter's at Rome, the grandest church in the world, was altered.

RAPHAEL, WHOSE WONDERFUL PICTURES WERE THROWN AWAY

While Raphael was working for the Pope he made some drawings called cartoons, from which famous weavers were to make tapestries, or wall carpets, to hang upon the walls of a chapel. When the tapestries were made, they were so wonderful that people looking at them thought they were paintings.

Years rolled away, and the King of England bought the cartoons. So fine did people think them that they actually built a factory and sent for many clever workmen to come and make the tapestries which Raphael had drawn. Then came another king who did not know how precious they were, and as nobody understood them they were treated as rubbish and lost. One day a clever man found them, and saw what they were, and they were then thought so much of that $2,500 was spent in making the frames to put them in. Money could not buy these drawings now, but one may see them at the South Kensington Museum. London

Many painters have come to be known by the name of the town in which they were born, or the place where they did their best work. This was so with the famous artist Correggio. His real name was Antonio Allegri, but he is known by the name of the town where he was born. Some of the best pictures in the world were done by him. One he did for the home of the monks at Correggio.

CORREGGIO, WITH THE SECRET OF LIGHT, AND RUBENS, WITH THE BIG BRUSH

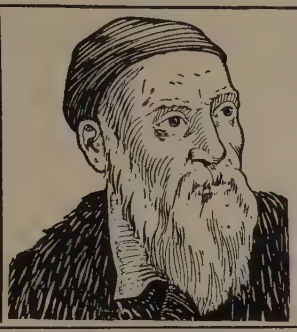
Artists were not very well paid in those days, and Correggio was paid less than $250 for a picture over the altar of the convent. One dark night thieves broke in and took the picture away. The people of the town were very sad when they heard of the loss, and two hundred people, rich men and poor men, went to the governor of the town and asked that the picture should be found and given back to them. But the governor could not get it back; so the people sent to the Pope and to everybody likely to help them. Still nothing could be done, and the picture, carried perhaps into some wicked rich man's palace, was never heard of any more.

Correggio learned the great secret of how to show in a picture the effects of light. Rembrandt's pictures show this too, but Correggio's light is much softer and gentler than Rembrandt's.

Another great artist was Peter Paul Rubens, a Dutchman. He was a poor boy. His father died in prison, but his mother had him educated by clever men. When he grew up he was so fine a gentleman that he could have made his fortune as an ambassador, had he not loved painting. His services as

TWELVE OF THE WORLD'S GREAT PAINTERS

Da Vinci painted in a life-like way. He makes us *feel* much more than we *see* in his pictures.

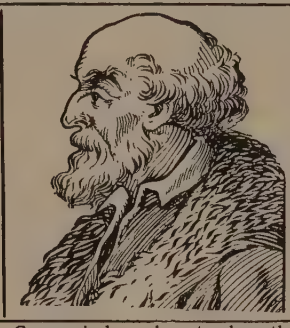


Titian was the best colour painter who ever lived. His colours are wonderful and full of meaning.

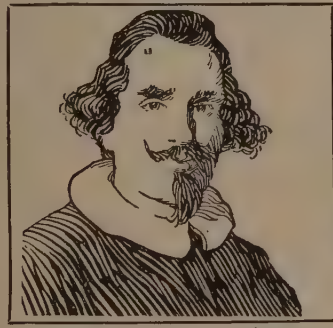
Raphael copied the best ideas of other painters, and painted pictures that seem almost perfect.

Van Dyke had more feeling than his great master, Rubens. His colours blend in beautiful harmony.

Rubens made a fine show by using a big colour brush. He was satisfied to make us *see* rather than *feel*.



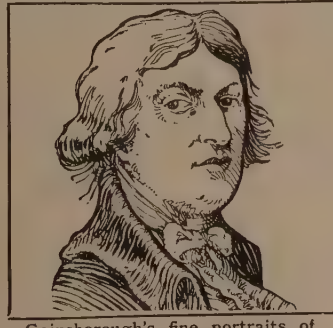
Correggio knew how to show the effects of light. His light is softer than that of most other artists.



Velasquez was clever in making us see the chief things in his picture, in which he put nothing unnecessary.

Rembrandt painted a man as a man is—so that we feel he is natural, and part of everything around him.

Hogarth's pictures show the vulgar side of life. He had a wonderful way of showing real character.



Gainsborough's fine portraits of handsome people really help us to understand the life of his time.

Reynolds used colour better than any other man then living. His portraits are bold and strong.

Turner stole the sunshine and put it in his pictures. No other artist ever painted sunlight so well as he.

an ambassador were much wanted, so Rubens used to go about from Court to Court to do duty for those who sent him, and while there he would settle down and paint. Rubens is called a great decorative painter. He made a fine show by using a big brush with plenty of colour. He painted ordinary things exactly as they seem to us when we do not think and try to understand their meaning. He was satisfied to make us *see* people, without trying to make us *feel* that they are real.

VAN DYKE, THE DUTCH PAINTER AT THE ENGLISH COURT

Anthony Van Dyke was born in the same town as Rubens and studied art under him. But he had much more feeling than his master. His colours are soft and "cool," and not glaring like those of Rubens, and they blend together in beautiful harmony, as notes in music do.

The English lovers of art thought a great deal of his work. Charles I. made him Court painter, and Van Dyke painted portraits of the Royal Family and of most of the great people in England. He did not live in England always, but used to go to the Continent for long holidays. No doubt he was glad to do some painting abroad, because he could not always get paid for the work which he did for the Royal Family in England. This was a great shame, for he did a picture that is famous all over the world. It is the portrait of Charles I. on horseback, and is in the National Gallery. Van Dyke died a poor man, but he was buried in St. Paul's Cathedral, before it was burnt down in the Great Fire of London.

VELASQUEZ, WHOSE SPLENDID PICTURES HUNG ON GLOOMY PALACE WALLS

Velasquez was the greatest artist ever produced by Spain. He painted pictures exactly as he saw them and painted them rapidly, without thinking them out as Leonardo da Vinci did. Yet, though they came to him so quickly, he had a wonderful way of making us see the important things in his picture, and he never put in anything which could be left out.

Velasquez had to teach himself. All painters in Spain at that time painted in one style, and that was a bad style. Velasquez went to a master who was painting in a different and better way. But this master was very cruel, and beat him, so he soon left and set to work to learn for himself the way to paint.

Over and over again he tried, until at last he was able to make a lovely picture called the "Water-Seller." This was shown to the King of Spain and at once made Velasquez famous. His splendid works were hung upon the gloomy walls of the Royal palaces in Madrid, and the world did not know until more than two hundred years later what a great artist he had been.

Then the French Army captured Spain, and the soldiers found the pictures in the palaces. When the Spaniards drove the French out again, King Jerome Bonaparte, a brother of Napoleon, carried off the "Water-Seller" in his carriage. But he was caught, and the picture was taken from him on a battlefield. The King of Spain gave the "Water-Seller" to the Duke of Wellington for driving his enemies away, and the picture was brought to England and hung in the duke's house near Hyde Park.

REMBRANDT, THE MILLER'S SON, WHO PLAYED PRANKS & PAINTED PICTURES

Another great Dutch artist was Rembrandt, the son of a miller. His work is very grand and famous, but in his lifetime people did not think as much of him as they do now. He was quite poor.

He was a man of great pranks and frolics. Once he was painting the portraits of a rich family. While he was doing so, someone opened the door of his room and brought in the dead body of a monkey. The creature looked so funny that Rembrandt felt he must paint a picture of it. The only thing on which he could make the drawing was the canvas on which he was painting the portraits of the rich people who were waiting. Although they were angry, he painted the monkey in among their portraits.

Rembrandt painted portraits as they had never been painted before. There are two ways of painting a man. He may be painted so that we *see* he is a man by his shape and form, or so that we *feel* he is a man because he is natural and seems to be a part of everything around him. Rembrandt painted in this way, and his portraits look almost alive.

THREE BEAUTIFUL PAINTINGS OF JESUS

THE BIRTH OF JESUS, AS PAINTED BY THE GREAT ITALIAN ARTIST, CORREGGIO

THE CHILD JESUS AND HIS MOTHER
PAINTED BY RAPHAEL

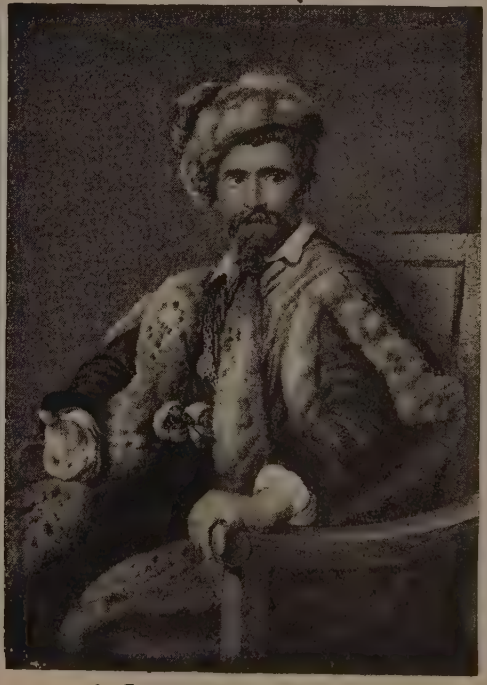
JESUS AND THE TRIBUTE MONEY
PAINTED BY TITIAN

PORTRAITS BY FOUR GREAT PAINTERS

NELLY O'BRIEN, BY SIR JOSHUA REYNOLDS

REMBRANDT'S PORTRAIT OF HIS DAUGHTER

PORTRAIT BY HANS HOLBEIN, THE YOUNGER



A PORTRAIT BY VAN DYKE

FOUR PEEPS AT THE PAST THROUGH OTHER EYES

A SHRIMP GIRL PAINTED BY HOGARTH

A GIRL PAINTED BY GAINSBOROUGH

A BOY AND HIS DOG, PAINTED BY VELASQUEZ

A MOTHER AND HER CHILD, PAINTED BY RUBENS

Some men preach sermons in the pulpit, some preach sermons in books and papers. William Hogarth was an Englishman who preached sermons by his pictures. He used to paint pictures which made people feel ashamed of being wicked and vain. Hogarth painted coarse and vulgar things, and his pictures show us very clearly the lower and sadder side of life. He had a wonderful way of showing the real character of people in portraits.

HOGARTH THE APPRENTICE, AND GAINSBOROUGH, WHO SKETCHED A THIEF

Hogarth was born quite poor, and was a silversmith's apprentice. When his pictures made him a rich man he bought himself a carriage, and went to see the Lord Mayor of London. When he came out he forgot all about the carriage. It was raining, and he called a cab, but could not get one. So off he ran in the pouring rain, and not until he got home did he remember that he had left his carriage outside the Lord Mayor's house!

Thousands of dollars are now paid for a picture by Thomas Gainsborough. But when he was a boy, living in an English village, nobody ever thought he was going to be a famous artist. He loved drawing better than his school lessons, and, instead of playing with other boys, would wander off into the fields and woods to study the flowers and trees, the sunshine and shadows, the birds and the fishes.

One day he saw a man looking over his father's orchard, as though he would like some of the pears hanging there. Little Thomas pulled out his pocket-book and drew a picture of the man. That night the orchard was robbed. The boy's sketch was shown, and it was found that the man whom he had drawn was the thief.

THE WONDERFUL PORTRAITS PAINTED BY GAINSBOROUGH & SIR JOSHUA REYNOLDS

This seemed so clever of the boy that at last his father made up his mind to let him be an artist, and he became one of the greatest artists ever known in England. Gainsborough painted fine portraits of handsome men and women, in which we see the extravagant manners and gay dresses of the people; and he has painted pictures that really help us to understand the life of the times in which he lived.

England has never had a more famous painter of portraits than Sir Joshua Reynolds, who knew how to use colour better than any other man who lived at that time. His portraits have a bold and vigorous feeling, and suggest strength rather than daintiness like Gainsborough's.

When he was twenty-one he caught a cold which left him deaf for life, and before he died he became almost blind, so that his last years were very sad. But he was a great and clever man, and, besides being a painter, he was a fine writer. His lectures on art are still read.

He was much beloved by all the great men of his time, but this did not make him vain. To the end of his life he was always trying to make his work better and better, and he was very modest.

TURNER, THE MAN WHO STOLE THE SUNSHINE AND PUT IT IN HIS PICTURES

Among the most wonderful pictures at the National Gallery in London are those by Turner. Nobody would think that they are the work of a poor London barber's son, who was so badly educated that he could not even spell. His father meant him to be a barber, but the boy was a born artist, and used to make little drawings which his father sold for about 25 cents. or so each. He would sometimes walk miles to sell a picture for less than a dollar.

When he was sent to the Royal Academy to study art he soon made himself famous. His pictures of landscapes and of the sea, and rivers, clouds, and sunshine, are marvellous. Turner was what somebody has called an artist in yellow. He stole the sunshine and put it in his pictures. No other artist has ever painted the sunlight so well as he.

His life was not happy. He made a great deal of money, but he did not use it well. He was very shy, and used to live in a cheap little house, calling himself by a name that was not his own, so that people would not be able to find him.

Although he was such a curious man and unsociable while he lived, he left large sums of money to the poor, and gave all his pictures to the nation.

The next stories of men and women begin on page **851**.

WHAT THIS STORY TELLS US

ON a summer's day, by watching a pool, we may see water insects make their way from the pond, slip out of their skins, like a diver out of his diving-dress, and, unfolding their gossamer wings, fly away in the sunlit air. That is a picture, seen in an hour of present-day life, of what took place in the world on a greater scale, millions of years ago. Then, however, instead of an hour, ages passed while the change was made. Insects freed themselves from the waters, and fishes followed them to the land, changing into reptiles and animals. They learned to climb, and leap, and fly, in pursuit of food. In that manner the flying animals called bats were formed. Other animals, finding their food in trees, on the ground, or down in the soil, were content to leap, or climb, or burrow. Here we read of some of these little creatures which once came from the waters, and of the lives they now lead. They are links between the old kind of life and animal life to-day.

ANIMALS THAT FLY AND BURROW

CONTINUED FROM PAGE 674

SOME of the commonest things in the world are the most interesting and wonderful. Let us see what mysteries the garden on a summer evening has for us. The sun has sunk from sight; the moon is up, the stars are shining. Birds have gone to their nests, yet dark figures are flying through the air, high up over the house-top and about it. What is that which flies so late, when birds, except the owls, should be sleeping?

It is not an owl; it is too small for that. It looks more like a swallow, as, dark and silent, it flits here and there. "It *must* be some strange night-bird," you say. But it is no bird; it is a bat—one of Nature's strangest little craftsmen.

"A bat must be a sort of bird, seeing that it flies," you may say. You need not be ashamed to make that mistake. For hundreds of years wise men thought the bat was a bird. But it is not. It is as much an animal as the great ape, the horse, and the lion. It is a mammal. Every animal which feeds its young upon its own milk is called a mammal. A bird lays eggs, and feeds its little ones upon insects or other food which it collects in the fields. A bat does not lay eggs; it feeds its young with milk in just the same way as the sheep feeds her lamb.

The bat is one of the links between animal creation of to-day and the animal life which first appeared in the sea and upon the earth. Strange creatures came out of the sea, and began to live on the land and in the air. Creatures which had been fishes followed these to the land, and became accustomed to live half their lives upon dry ground and half in the sea.

It did not all happen in a day, or in a century; long ages passed while these creatures were being slowly changed from one form into another.

One of the changes made it necessary that some animals should be able to rise into the air, to seek their prey or to escape becoming the prey of others. They started climbing trees and leaping from branch to branch, and from the high branches to the ground. In that way one form of reptile became the first of birds, the archæopteryx, which means "ancient wing," of which we have read on page 47. In the same age the bats were perhaps formed. The first birds had great teeth, but no birds now have teeth. Bats have teeth, sharp and strong as the teeth of a tiny cat.

The most wonderful feature of the bat is, of course, its wings. These are beautiful thin webs of tissue growing out from its body like an umbrella.

If you could take away the webbing you would see a little animal with two arms and hands and two hind legs. But though it has the same number of fingers as we have, they are strangely formed. The thumb is very short, and, instead of a nail, has a claw or hook, which is used when the bat is not flying, to enable it to walk or to hang itself to anything upon which it means to rest when it folds its wings to go to sleep.

THE MYSTERIOUS ANIMAL THAT FLIES ABOUT IN THE NIGHT

The bones of the palms of the hand are not short and like ours, but very long, and joined to them are the finger-bones, which again are very long. This great length of bone is to support the web of the wings. The web stretches from the shoulders down the two bones of the arm over the bones of the hand, and down the tips of the four fingers. Then, from the under side of the arms, it reaches down to the legs, as far as what would be our ankles, and between the legs to join on to the tail.

Thus the spread of the wings is very big for the size of the bat. The biggest American bat has a body three inches long and a tail one and a half inches in length—only four and a half inches all told, yet its wings, when spread out, measure twelve inches from tip to tip.

There are few other common mammals that we know less of than the bat. The reason is that it only comes out at night. Its eyes are so formed that it must sleep when the sun is shining, but at night it can see splendidly. It lives entirely on insects, and by eating these does good work for man. We cannot see the insects which it catches, but the insects are in the air all the same; and if the bats did not catch them they would be a great nuisance to us.

SOMETHING ABOUT BATS THAT NO MAN CAN UNDERSTAND

There is something about the bat which none of us can understand. Added to its good sight, it has the most wonderful power of feeling its way through the air. There is a great network of nerves and veins all over its wings, and there are clusters of nerves about its nose which act as a sort of telegraph to control the wings as the little animal flies. To realise what this sense of touch means to the bat, read this story:

A man who gave his life to the study of animals once tested bats in a strange way. He got some bats, whose sense of sight, and sense of smell, and sense of hearing had gone from them. There was no doubt about it; the bats could neither see, smell, nor hear. He turned them loose in a room in which were many corners and obstacles against which they were likely to dash themselves. They flew without fear about the room, and never came in contact with anything that might hurt them. Then the man strung many threads across the room, but the bats flew between them as easily as if nothing were there. When the man placed his hand in the way of their flying, though they could neither hear, see, nor smell, they avoided it.

Bats are like birds in this respect—that their blood is very hot, but there is this strange difference. The bird dies if it cannot keep warm. The bat, however, goes to sleep in winter. Its sleep is so like death that you would think the bat in its winter sleep dead. It almost ceases to breathe, and its body, so warm in summer, is in winter almost quite cold.

THE FLYING FOX, THAT EATS THE FARMERS' CROPS ABROAD

All the Northern bats, of which there are about fifty varieties, eat insects, but there are foreign bats which do great mischief. The fruit-eating bats do not live in this country, but in Japan, Australia, the Pacific Islands, the Malay Islands, India, Ceylon, Madagascar, and South America. The biggest of these measures nearly five feet across the wings. It is called the flying fox, because it has red-brown fur and a head like a fox. As they eat a great deal, they cause much damage to the crops, and in some places the natives have to tie up the growing fruit in baskets, to keep the bats from eating it at night.

The ugliest bat of all is one of the vampire bats, called the desmodus. This attacks cattle and horses, and poultry, and even human beings, as they lie asleep. With its sharp teeth it makes a tiny hole in the flesh, and draws large quantities of blood from its victim. In some parts of the world it has been found impossible to keep poultry, owing to the dreadful habits of these bats. It used to be supposed

LITTLE ANIMALS THAT JUMP AND FLY

The bat flies, but is really a little animal like a mouse, with huge webbed arms and feet which serve as wings. It lives on insects and sleeps all winter.

The fruit-bat in the tropics, which does great mischief by eating ripe fruit, is called the flying fox, because it has reddish fur and a head like a fox.

The flying lemur does not really fly, for it has no wings. Its skin is very loose, and it can spread it out like a kite and so take wonderful leaps through the air.

The flying phalanger leaps like the flying lemur. It has a curious pouch like the kangaroo, in which it carries its young ones till they are old enough to go alone.

The flying squirrel is a delightful little animal that can also take great flying leaps. It lives very largely on nuts, like other squirrels in our woods.

The common squirrel, with its bushy tail, forms a pretty sight as it scampers about in the woods. It makes a neat little nest and stores up nuts for the winter.

that the bite of the bat would kill a man, but that is not so, and the stories told of their causing men to bleed to death are not true. It is true, however, that they will draw blood when they can. They enter a room at dead of night, and if they find a man's feet uncovered they bite them, and draw blood till their appetite is satisfied.

There are other animals which are said to fly, but the bat is the only one which can fly as a bird does. The others seem to have stopped where the bat began when it started to fly. We have read already how the gibbon seems to fly as it leaps from tree to tree in the forest; and we have read how the lemurs were the parents of all the monkeys. Well, there is a lemur to-day which goes much nearer than the gibbon to flying.

This is called the flying lemur, and lives in the Indian Archipelago. It is an animal about twenty inches long, and lives in high trees.

THE CURIOUS LITTLE ANIMALS THAT LEAP TWO HUNDRED FEET

In the course of thousands of years, when seeking its food—nuts and fruit, and insects and eggs, and young birds—this kind of lemur has found that it is easier to leap from tree to tree than to come down one tree and run up another. So it has taken to leaping, and, in order better to leap, it has been used to spread out its arms and legs like sails, with the result that a great membrane, like a sail, has grown out from its skin and joined its legs and arms and tail together, so that, when it springs from the top of the tree, it sails through the air on a sort of raft of skin, something like a boy's kite. It can make leaps such as no other animal can equal. See it at the top of a tree. It wants something which it sees far away. Without a moment's hesitation it throws itself into the air, and sails to the spot, over two hundred feet at a jump!

Australia and New Guinea have flying animals called flying phalangers, and in various parts of the world there are flying squirrels. Then there is the flying mouse, or opossum mouse, as it is called. The flying phalangers and the flying mouse carry their babies in pouches; but we shall come to the pouched animals in our next story.

Here we need only talk about their flying. They "fly" as the lemur does, by the aid of a fold of skin extending along the four legs and sides, but not including the tail. This fold of skin is not stretched out until the animal wishes to leap through the air; at other times it is kept close by the side of the body.

THE FLYING SQUIRRELS AND THE CLEVER LITTLE SQUIRREL WORKERS

The flying squirrel is different from the phalangers, which eat insects. The flying squirrel is a rodent—it gnaws bark and buds and nuts like other forest squirrels. The phalangers and flying mouse can, to a slight extent, direct their flight, but the flying squirrel swoops down in a slanting direction, sixty feet at a bound, but without altering the direction of its motion.

Red squirrels cannot fly, but they race about the trees at such a rate that they almost seem to do so. With their slim little bodies, their handsome, bushy tails, and their bright, large eyes, they are delightful little things to watch, as they scamper about the woods. Few animals are more playful when wild. They race and frisk about for the very joy of it. Yet they are among the cleverest little workmen in our land.

Although they make their homes in great shady trees, they know that rain and wind and snow come there, so they build the neatest little nests you ever saw. First they make a floor by lacing twigs in the fork of a tree, then they build a little roof over it, with the twigs so tightly woven that no rain can get through. Next, they carpet the floor of the nest with the nicest moss. The entrance is made at the bottom of the nest. On the opposite side there is another hole; through this the squirrel can escape if his enemy, the marten, or the cat, should pay him a visit. It serves also the purpose of ventilating the little home and keeping it always sweet and healthy.

HOW THE SQUIRREL WAKES UP FOR HIS NUTS AND GOES TO SLEEP AGAIN

But suppose that the wind blows the rain in through one of these little passages. Master Squirrel knows what to do. He takes up some moss in his clever little hands, and with it he blocks up the entrance through which the rain comes, and so is warm and snug again until the storm passes over.

Merry as he is while the summer and autumn last, the squirrel does not let the days pass in idleness. He collects nuts and berries, and stores them in holes in the trees or in little pits which he digs at the foot of the trees. When cold winter comes on he retires to his house to sleep. He sleeps a long time, though not as long as the bat. From time to time hunger wakes him. He gets up, runs off to one of his little storehouses, has a feast of nuts, and then goes back to bed to sleep again.

A traveller named Regnard says that in Lapland, where squirrels are numerous, there are many lakes and rivers to cross. The squirrels at certain times of the year have to change their homes, but the rivers and lakes are in the way. That does not stop them. The squirrels take the bark of a pine or a birch tree, drag it down to the water, and push it in. They then place themselves upon it, and set out for the opposite shore, while their big tails act as sails by catching the wind, and so driving their raft to the shore which they wish to reach. Sometimes the wind is too strong, and then there is a shipwreck, and the squirrel sailors are drowned.

THE GREAT MARCH OF THE LEMMINGS OVER THE MOUNTAINS

The bravery with which these squirrels are said to cross the waters may remind you of the lemming, another animal of Lapland. This is a rodent of about the size of a rat. Its numbers multiply greatly during the year, and at a certain season armies too big to count—big lemmings, little lemmings, young lemmings, old lemmings—set off on the march. They go in a straight line. They march over mountains and down valleys, they swim rivers and lakes; they pass through towns, they eat their way through crops. Bears, wolves, foxes, lynxes, hawks, and owls follow to prey on them. Multitudes of them perish on the way, but nothing stops the survivors until they reach their journey's end—which very often is the sea, into which they plunge, to be drowned at last.

German people call our little bats flitter-mice, and the big bats "rat-bats." They believe that the bats are really mice and rats, which in some strange way have learned to fly. By this time you will have learned that there is very little likeness between bats and rats and mice. Our bats live entirely on insects; rats and mice do not eat insects. An insect is about the only thing a rat will not eat. Almost anything is good enough to make a rat's supper. They will eat eggs, young birds, fruit, butter, vegetables, good and bad; they eat one another; they will gnaw their way through the flesh of living animals which cannot help themselves; they have been known to gnaw the toes of elephants in captivity, and we have read already how they tried to eat the paws of the old lioness at the Dublin Zoo. They do more damage than any other animal in this country.

THE RATS, THAT LIVE ANYWHERE AND SPREAD DISEASE AMONG US

They can go almost anywhere. They can burrow under stone walls; by the help of their sharp claws they can climb up smooth fences; they can swim across rivers and streams. They live in the sewers; they live in the cellars and in the attics; under the floor of the dining-room; in ships, in docks and warehouses and shops. Wherever a rat can go and live, there you are almost certain to find one.

In olden days the rat was of real use to man. Before we had clever, careful men to look after the drains and sewers, rats helped to keep us healthy by eating up waste food and vegetables, which by decaying would have caused fever. But now we have better means of preserving health than by trusting to rats.

It has been discovered that rats themselves breed disease. They get into pigsties, and are sometimes eaten by the pigs. The rat has a disease which is passed on to the pig, and from the pig to human beings. That is not the worst danger. Rats have microbes in their fur which, when they come into contact with a human being, may convey disease.

THE GREAT WAR AGAINST RATS ALL OVER THE WORLD

So men have had to declare war upon the rat all over the world. But its numbers are so great, and it is such a cunning animal, that it is not easy to destroy. It is bold and brave, and when threatened by a man from

whom it cannot escape it will savagely attack him with its sharp, strong teeth.

The grey house-rat is not a native of America, or even of England, but of China. It came west long ago, and began to be noticed in England about 300 years ago. England then had a native black rat, some of which came to New England in the earliest ships. The grey rats killed off all the black ones, and themselves have spread all over the world by getting into the holds of ships, and then going ashore at various ports. They can endure any climate, and thrive on any food. It should be the effort of everyone to keep them out of their houses, and to kill them.

Mice are almost as destructive as rats. Ladies are very much afraid of them, not because the little animals are dangerous, but because they run so nimbly and can climb about with such skill. They multiply as rapidly as the rat, and are only less dreaded in a house because they cannot eat so much and because they are not fierce.

THE MANY KINDS OF MICE LIVING IN THE WOODS AND FIELDS

There are many varieties of mice. There is the beautiful little harvest mouse, which weaves a wonderful nest on the stems of grass in the fields; and there are also the field-mice. Most of them live wild in the woods and fields.

One of the prettiest is the German dormouse, which is a little gem, of light, reddish-brown colour, with a little short tail. Many children keep dormice as pets. They are not very satisfactory, because, while the children are up, the dormice want to be in bed. Like bats, they want to sleep in the daytime and to work at night.

Although you might not think it, the dormouse is a great jumper. His feet are beautifully padded, so that when he reaches the ground after a big leap he shall not hurt himself. This little animal eats hazel-nuts and acorns when these are plentiful; but before the nuts ripen it eats corn and the seeds of flowers, and the eggs of small birds. In this way it may do damage, but then it makes up for this by eating a great number of grubs and caterpillars and other insects which would injure our crops.

The dormouse makes a beautiful nest like a bird's, in big nut-bushes. It stores the nest with food which it can eat should it wake up in the winter feeling hungry. Luckily it does not wake when the weather is cold, so there is not much chance of its food supply running short before it comes out again into the world in April.

THE MICE THAT LIVE IN THE STRAWBERRY-HOUSE AND EAT THE SEEDS

There is plenty of food out in the woods and fields for mice, provided that they do not become too numerous. They eat the nuts which fall from the beech, the oak, and other trees. It is when food is scarce and the mice too many that they become a nuisance. In the garden of the house in which this story is written there are hot-houses in which strawberries are grown. When the field-mice become so numerous that they cannot get enough to eat, they make their way to where these strawberries are, and eat them. It is not the fruit itself which they like, but those little seeds which you see on the side of the strawberry. Strawberries like these, grown when there are no strawberries in the fields, are worth five dollars a pound, so you may be sure that the mice are not welcome when they are doing this damage.

But there is a lesson for us here, which shows that, wise as man is, Nature is wiser. When we plough up the land or cut down the woods in which the mice have lived, they are driven into our houses. On the other hand, if we let the mice get too numerous, the same thing happens. We let them get too numerous by destroying our friends and their enemies.

Gardeners and farmers shoot owls and other birds and animals which live upon mice and rats. The result is that the mice multiply alarmingly, and become so desperate for food that they destroy the corn-ricks, gnaw off the bark of young trees, eat the buds of fruit-trees, bite off all the young shoots of such trees as they can eat, and create havoc.

THE MICE THAT RAN INTO THE PITS IN THE FOREST OF DEAN

They tunnel in the ground and eat up the grain the farmer has sown, and so do more damage than you could believe.

There was a plague of mice in the South of England some years ago. They gnawed the roots of the young oak-

ANIMALS THAT TUNNEL IN THE EARTH

The black rat is the original American rat, and is now extremely rare. It is not so strong as the grey rat.

The grey rat is supposed to have come in cargo ships from Scandinavia. It has almost killed off the black rat.

Everyone knows the common house-mouse. It is a pretty little creature, but is destructive.

The harvest mouse is the smallest of our native mice. It lives in the fields and makes a clever nest on the corn-stalks.

The dormouse is a reddish-brown colour with a short and hairy tail. They generally sleep during the day and feed at night, and are torpid in winter. They can jump a height of six feet.

The lemming lives in Lapland. Huge companies of them sometimes travel across the country, and nothing but fire will stop them.

The field-vole is not a mouse. It has a thicker head and a shorter tail. It is often so plentiful that it becomes a great plague by eating farmers' crops.

The water-vole lives by the riverside and feeds on plants. It never destroys fish, and so it ought not to be treated as an enemy. It swims and dives well.

trees, they killed the chestnut-trees; they gnawed the bark from the hollies, and nibbled off all their buds.

People did not know what to do, until they asked a wise old man who was in the habit of making pits and wells. He knew what to do. He found that mice tumbled down the pits which he dug, and could not get out. So he made a great number of pits where the mice were. He made each pit two feet deep, and two feet wide at the top, but rather wider at the bottom. The pits were made about twenty yards from each other. Mice tumbled into these in thousands. He himself was paid rewards for catching 100,000 mice; but that was not nearly all that were caught.

Weasels from all parts of the country-side gathered about the pits, and ate fat mice night after night. Owls and kites and hawks got news of the feast, and swarmed down upon the pits, and ate till they could eat no more.

THE HANDSOME LITTLE VOLE THAT IS BLAMED FOR THE RAT

Mice are not the only wild things in our fields which do damage. There are also the voles. The field-vole is about five inches long, including the tail, which measures a little over an inch. Its body is about as big as that of a big house-mouse, but its tail is shorter. The house-mouse has a scaly tail, like the rat, but the field-vole's tail is hairy.

Sometimes in the lowlands of Scotland it appears in vast hordes. Then the swarm will destroy a thousand birch-trees in a single district by gnawing the bark away. Sheep have been starved in Yorkshire through the field-voles eating all the grass. In Germany harvests have been ruined, although 1,500,000 voles were once killed in a fortnight.

This vole, which is so much heard of as creating what are called "plagues of mice" in Europe, is represented in the United States and Canada by several similar kinds of animals, which we call meadow-mice, or short-tailed field-mice. They are chuncky in form, with blunt noses, and have short, hairy tails. All would rather live in damp than in dry places, although none are actually aquatic, as is the large brown bank-vole, or water-vole, so well known in the rural parts of England. They throng in marshes, and especially in salt marshes near the ocean-coast, and seem to know in a wonderful way when the tide is coming, or when the ground is to be overflowed, for they rarely get overtaken by water and have to take to swimming.

In such marshes, and in wet meadows everywhere, you may see their little paths cut through the grass, along which they scamper back and forth. Now and then, if you watch quietly, you may see a meadow-mouse itself; but not often, for they are shy, and, besides, they go abroad by night more than by day, when they stay hidden snugly in a shallow burrow just beneath the sod. In winter they make warmer nests, and run around in tunnels through the old herbage and leaves under the snow. It is then that they do most of the damage chargeable to them, for there is no insect food or green plants to eat, and so they gnaw the bark from about the base and roots of orchard trees, and often spoil whole nurseries of young trees and bushes which have been wrapped in straw to protect them from freezing. The meadow-mice think this is fine, for the straw makes them a snug house, and the young bark is capital food.

THE PRETTY WOOD-MICE AND THE PRAIRIE-MICE THAT MAKE NESTS AND BURROWS IN OUR WOODS AND PLAINS

North America abounds in true wild mice, and many of them are delightful little animals, that do little or no harm, except by stealing some of the farmer's grain. The commonest of these in the east is the white-footed deer-mouse, which is so called because it has a coat of the same fawn-red colour as that of the Virginian deer. It lives in bushy places, eating seeds and insects and nibbling berries, with much the same habits, in fact, as the squirrels, and, like them, it makes a great store of seeds and small grain stowed in holes in the ground or in old logs. It is fond of packing an old bird's nest full of hay to make a winter nest, but does not stay in it all the time. Another common red mouse is the jumping-mouse, which has great hind legs and a very long tail, and is, in fact, a real American jerboa. In winter it sleeps in a nest almost underground.

There are several very interesting and beautiful western mice, called kangaroo-mice, pocket-mice, and so on, of which you may read in books.

The next Nature Stories are on page 859

WHY DOES A MATCH STRIKE?

CONTINUED FROM PAGE 685

MATCHES are very useful, and also very interesting things, said the Wise Man, and there is a lot to say about them, but first of all I can answer your question very quickly. A match strikes because you make it warm by rubbing it.

You know that you have to rub it against something rather rough, so that there is a good deal of friction. The movement of the match is hindered by the rough thing you press it against, and that is what we mean by friction. This makes the match hot. Rub the tip of your finger on your coat, and you will make it hot, too.

Now, the whole point about the match is that its head is made of a mixture of things to which nothing happens as long as they are kept ordinarily cool, but as soon as they are made hot enough they catch fire —that is to say, they combine with the oxygen of the air, and so burn.

Our business, then, is to get a kind of mixture which will stay on the end of a piece of wood, or some such thing, and will catch fire even when made only so hot as we can make it by rubbing. About a hundred years ago the first friction match was made, and almost the best of these at first required a lot of friction, for it had to be drawn up between pieces of sandpaper before it would catch fire. Then the curious element called phosphorus, which really means light-bearer, began to be used, and matches were made very like those that we use now.

The peculiarity of phosphorus is that it readily catches fire just as we want it to do, but a number of other things are put into the match-head, and especially something which itself contains oxygen, and can supply it for purposes of burning even more readily than the oxygen of the air. That is why you get a little explosion when you strike a match.

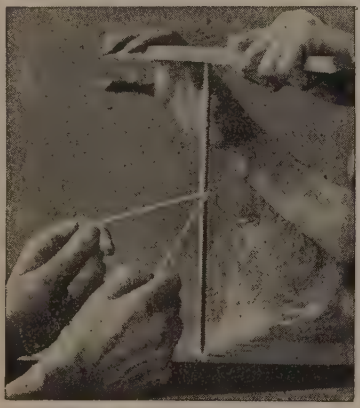
But, of course, there is a certain amount of danger in having anything which will catch fire so readily. Thus, if you have ordinary matches loose in your pocket, they may get accidentally rubbed and will catch fire. Therefore, it was a question whether there could not be made some kind of match which could be struck quite readily, but of which we could be sure that it would strike only when we really meant it to.

This kind of match was invented more than fifty years ago, and we call them safety matches. The point about them is that there is no phosphorus in their heads; the phosphorus is put on the outside of the box instead, and so this kind of match is almost certain not to catch light except when it is purposely struck where the phosphorus is.

THE EARLIEST WAYS OF MAKING A FIRE

There was once a time, very long ago, when man did not know how to strike a light or make a fire to warm himself or to cook his food. But one day he found out that by rubbing dry wood together he could produce enough heat to set light to dry grass or moss and thus make a fire. This picture shows one of the ways in which he did this.

Another way in which man rubbed the wood was to twirl a dry stick in a hole, or socket, cut in a dry plank or tree-trunk. This caused smoke to rise, and then fire would burst forth as shown here.



A little later man found that by using a socketed piece of wood to hold his fire-stick upright, and getting a friend to pull the stick round, it could be made to revolve more rapidly, so that fire came quickly.

Man then learned to make fire without help by holding his socketed stick in one hand and pulling the string with the other, attaching the other end of the string to the cord of his bow, which he fixed at a convenient place. When he left off pulling, the stretching of the bow pulled the string back, so making the fire-stick revolve.

Another way in which man made fire was to cut a slot in a piece of bamboo, and saw this slot with another piece of bamboo, as in the first of these two pictures. Little fragments were worked off, and the friction caused these to catch fire. Man made a great step towards matches when he discovered that by striking a piece of metallic stone against a flint he caused a spark to fall. He used to catch the sparks upon a little heap of dry moss, so kindling a fire.

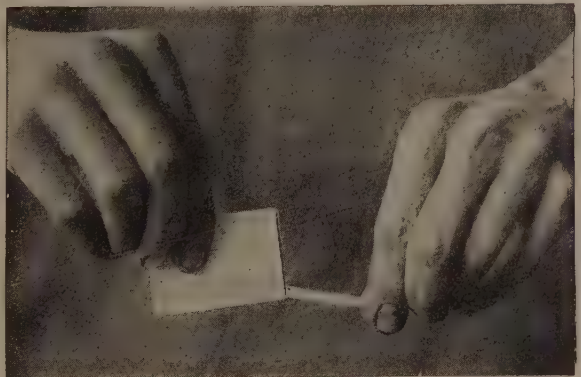
HOW MAN LEARNED TO STRIKE A LIGHT

When iron and steel became known to man, he was able to improve his fire-making outfit. He had a rough box in which to keep his piece of flint, his steel, and the half-burnt cloth, called tinder, upon which he caught his sparks. This picture shows us how the steel was struck upon the flint, driving a spark into the box, from which a thin smoke is rising, showing that the tinder is smouldering.

This is a tinder-box like a pistol. A piece of flint was shot against the upright piece of steel, and a spark fell into a box below so rapidly that wind or rain could not put it out. A bundle of sulphur-tipped wood matches is below.

The first match at all like those which we use to-day was invented by a Frenchman named Chancel in 1805. The chemicals which formed its head burst into flame when they were dipped into a bottle of acid.

A little later the matches shown here came into use. Each was made of rolled-up paper, the tip being dipped in chemical preparation. Within the tip was a tiny glass bulb filled with acid; and when this was broken by pressure between pincers the acid escaped, mingled with the chemicals, and set fire to them.



The first really practical lucifer match was invented by John Walker, an Englishman. It was a match very like those which we use to-day, and was struck by drawing it through a piece of folded sandpaper. These matches were sold at two cents a dozen.

The safety match that we use strikes easily and is safe. It is one of the simplest and tiniest of things, yet it took man hundreds of years to learn how to make it.

Now, there are at least two different kinds of phosphorus, and the commonest of these, white or yellow phosphorus, is a very deadly poison. One grain of it may easily kill a man. People have often been killed by swallowing match-heads. Further, this dangerous kind of phosphorus is used in the heads of ordinary matches, and the people who make those matches used often to suffer from phosphorus poisoning until within the last few years, when people have begun to attend to the matter.

WHY IS A SAFETY MATCH SAFE?

On the other hand, what we call safety matches are safe in both ways; in the first place they are safe because they cannot catch fire accidentally, and in the second place they are safe because no poisonous phosphorus has anything to do with them at all. The phosphorus which is put on the outside of the box is of another kind, called red phosphorus, and this kind is not poisonous.

It is a pity that we do not use safety matches more generally, for even now, though people are much more careful than they used to be, the making of ordinary matches is dangerous. Not long ago the Belgian Government offered a big prize for a "strike anywhere" match that should contain no poisonous phosphorus. Two Frenchmen succeeded, and now these safe matches are being used more and more every year. Since they began to be made in France, there has never been a case of phosphorus poisoning, and we do not hear now of people killing themselves by swallowing matches.

Many of the great manufacturers now make these new matches, and their workpeople do not get ill at all. Probably all civilised countries will stop altogether the use of poisonous phosphorus in match-making.

WHY IS IT COLDER ON A MOUNTAIN-TOP?

You think, perhaps, that as you are nearer to the sun you ought to get hotter. It is true that as we get nearer to the sun we must get hotter, unless something else is working the other way at the same time. But the highest mountain on the earth is not seven miles high, and as no one has even been to the top of it, and as seven miles is not much worth mentioning, seeing that the sun is more than ninety millions of miles away—well, you cannot expect to gain much by climbing a mountain. For the matter of that, the earth is much nearer to the sun in winter than in summer, but the sun is so far away that that makes little difference.

But now you want to know why you get colder. It is because the warmth that we live by is mostly in the surface of the earth, though doubtless most of it has come from the sun in the first place, and the air, besides being necessary for us to breathe, is also a great blanket that keeps in this warmth. When we climb a mountain we pass through the densest part of this blanket, and pass away from the warm crust of the earth, and so we get cold.

It is just the same when men go up in a balloon. On the other hand, if you go down into a coal-mine you get hot, though if you do so in the daytime you are actually going further from the sun. We should all be frozen to death in the night if it were not that the earth is warm itself, and that the blanket of air keeps the warmth in for us.

HOW DO WE KNOW THE HEIGHT OF A MOUNTAIN?

It is not very easy to measure a mountain, but there are various ways of doing so. One of them is too difficult to explain here, or to anyone who has not learnt a good deal about angles, and so on, already. But there is a much less difficult way of measuring the height of a mountain, though it is not such an exact way. In order to use this way you must go up the mountain yourself, and it will, at any rate, tell you how high you have gone. People use this way when they want to know how high they have gone in a balloon. They take up a barometer, or a weather-glass, with them.

Now, a barometer is simply a measurer of heaviness; it measures how heavy the air is above it. The higher you go the less air there is above you, and so, as you ascend, the mercury in the barometer moves in a little tube according as a less weight of air presses upon it from above. If you know already how much difference it makes in a barometer to go a certain height, then you can tell how high you are on a mountain or in a balloon. But you

must use the other way, with measurements of angles and special instruments, if you want to measure the height of a mountain without climbing it.

WHEN I WALK IN A MOVING TRAIN, AM I MOVING FASTER THAN THE TRAIN?

We ought to know which way you are walking. The answer to the question is yes, if you are walking in the direction that the train is going. But if you are walking from the front of the train to the back, then you are moving more slowly than the train. There can be no doubt about the answer, because you can prove it by trying.

If two of you got into the back of the train when it started, and one of you walked right through the train, if he could, to the front, then, when the train stopped, he would get out on the platform much further forward than the other. He would have travelled further in the same time than his friend, and further than the part of the train his friend was in, and thus further than any part of the train. He has added his own movement compared with the train to the movement of the train compared with the earth. But we can add to this. The earth is moving too, and if the train is moving on the earth in the same direction as the earth is moving through space, then the train is moving through space quicker than the earth. And if you are walking from the back of the train to the front, you are travelling through space quicker than the train, and still quicker than the earth. And if a fly, meanwhile, is walking across your cheek, from your ear to your nose, it is travelling through space quicker than you, or the train, or the earth!

DOES AN OUTSIDE HORSE ON A ROUNDABOUT MOVE FASTER THAN AN INSIDE ONE?

Certainly it does. It is in the same position as the outside boy or girl in drill-games in the gymnasium, when you form lines like the spokes of a wheel. The children near the centre almost mark time, while those on the outside may have to run. So with a sling. You put the stone at the end of the sling, because when you swing it a slow movement of your hand means a quick movement of the sling. The further the sling is from your hand the quicker it goes, and the quicker the stone is moving at the moment it leaves the sling the further it will fly. So with a hammer. The longer the handle, the greater its power. If you had a hammer with several heads on the handle, the end head would do the most work, because, like the outside horse on the roundabout, it is moving more quickly than the others, and its power is due to its weight *and its movement.* You will be able to think of other examples of this for yourself. What about something on the rim of a wheel, for instance, compared with something near the axle? The outside, of course, goes round more quickly than the axle.

WHY DO WE SEE THE FLASH FROM A GUN BEFORE WE HEAR THE NOISE?

When the gun goes off it produces at the same moment *light,* which makes the flash, and *sound,* which makes the report. Light is a wave in something which is everywhere, and is called the ether; and sound is a wave in air.

Like all waves, in water, or air, or ether, these waves take time to travel. But sound waves travel very slowly compared with light waves. Sound moves only some hundreds of feet in a second, while light will go more than 180,000 *miles* in a second! If you are very near the gun you will hear the report and see the flash so nearly together that you cannot say which was first; but the further you are from the gun the greater will be the difference of time, because the light reaches you so quickly, while sound comes lagging after it. You will see the flash always within a tiny fraction of a second after it happened, but the sound wave may take a second or two to reach you if you are far away.

Just in the same way, if you watch a game of baseball from a distance, you will *see* the bat hit the ball, and then, afterwards, you will *hear* the bat hit the ball. Light travels from the sun in about eight minutes, and from the nearest star in about four years. Sound never reaches us from the moon, or the sun, or the stars, because there is no air in between to carry it.

WHY DOES THUNDER FOLLOW LIGHTNING?

The answer is the same as to the last question—because light travels quicker than sound. The lightning is made by the movement of electricity in the air, usually between two clouds. This

movement makes heat as well as light, and the heat causes the air close by to spread itself out, and this starts a great wave of air—which is the noise we call thunder. This noise, or sound wave, comes after the light wave, simply because sound waves move more slowly than light waves.

Now, here is something that will be of use to you in the case of a thunderstorm, especially when people are frightened, as many children are if they have been told foolish stories, and as some children and even grown-up people are, stories or no stories. For when there are some seconds between the lightning and the thunder, we know that the storm is really far away. The further the storm, the longer the interval between the lightning and the thunder; and you can comfort frightened people who think the electricity in the storm may hurt them by showing them that it must really be far away, since the sound comes so long after the lightning.

WHAT MAKES US SNEEZE?

Usually we sneeze because there is something in our nose that should not be there. The nose is the proper channel for the air we live by, and our brain is made so that when anything interferes with this channel it makes us breathe out violently through the nose, and that is a sneeze. The inside of the nose must be very ready to feel the least thing so as to tell the brain what is wanted. Of course, it is not *we* that do this—indeed, we can't really sneeze on purpose if we try—but it is the unthinking part of our brain; and as it cannot always tell whether sneezing is needed or not, it often makes us sneeze when the blast of air through the nose has nothing to clear away, and the only trouble is a little itching.

We sneeze at pepper, because it irritates, or violently tickles, the inside of the nose. One kind of sneezing is due to something in the way the nerves of the brain are connected, and is not a bit of use, and that is sneezing at a bright light, usually the sun. To blink at the sun is sensible, for that protects the eyes, but there is really no sense in sneezing at it. You can stop a sneeze almost always, when you feel it coming, by pressing on the nose, especially on each side, about half-way down, just where the bone stops. There is a little nerve here which, when it is pressed, tells the brain to go no further. No one really knows the reason why

WHAT MAKES US YAWN?

We yawn when we are tired, or sleepy, or bored. Now, in all these states the truth is that we are not breathing as deeply as we should, and our blood has not got enough air—or, rather, enough oxygen from the air—in it. There is a tiny but precious speck of nerve stuff in our brains which looks after our breathing, and it is very sensitive to changes in the blood, when these mean that something is not quite right. When it finds that there is not enough oxygen in the blood—and it seems to find this out suddenly—it gives an order for a great deep breath that shall put things right. And that is why we yawn, for a yawn is simply a sudden deep breath *inwards*, just as a sneeze is simply a sudden deep breath *outwards*. When people are not quite well, they sometimes yawn almost all day, and this is not a good sign, for it means that their breathing is not doing its work properly, and that these repeated efforts to catch up with the need for air have become necessary.

WHAT MAKES US STRETCH?

This question, said the Wise Man, might have gone in with the last, for we often stretch and yawn together, and really for the same reason. When first we are born, we always stretch and yawn, and if a baby does not do this, people have to smack it gently until it does; for a baby must breathe well, and yawning and stretching mean good breathing. The stretching does not *directly* help us to breathe, but it does so in a roundabout way. When we stretch our limbs and body, we squeeze upon many of our blood-vessels, especially those inside our muscles, and so we make it harder, for the moment, for the heart to drive the blood in through them. This, however, is just the little spur the heart needs, and it at once replies by beating more strongly.

By this time we have stopped stretching, and so the heart, without having any harder work to do than before, is working harder. So the blood moves more quickly through the body, *including the lungs*. Now, it is the blood that carries the air from the lungs to every part of the body, and the quicker it

goes through the lungs the more air it can take up. So stretching helps us to breathe, and fits in perfectly with the taking of an extra supply of air into the lungs, which is what yawning does for us. Really, then, yawning and stretching are wonderful powers of the body, beautifully fitted for their purpose. It is, of course, the brain that looks after them both, and fortunately it does not need teaching, but we are born with brains that know how to do it.

WHY IS IT RUDE TO YAWN AND STRETCH?

You will be surprised, perhaps, that I should praise yawning and stretching, though they are rude. They are rude, not in themselves—no one minds you yawning and stretching when you are alone—but because people know that they are signs of tiredness or being bored; and if you do these things in company it is almost like saying that your friends are tiring you. That hurts their feelings—it would hurt yours—and so it is rightly called rude. If you must yawn, you should put your hand to your mouth. I believe, said the Wise Man, this really began in a silly idea that little goblins ran in and out of the mouth when it was opened; but you should do it all the same, for it hides your face when the yawn is making it ugly, and you have no right to force other people to look at ugly things.

WHY IS THIS BOOK EASIER THAN LESSON BOOKS?

This is a nice question, said the Wise Man, and a useful one. I am sure there are some lesson books, or there ought to be, which are no harder than this book. But the trouble with most lesson books is that they begin as a grown-up man would begin, if he were to learn a new thing, or as he thinks he would begin. But the right idea is to make a book for children which takes things just as the child would take them for itself. The child's mind has its own ways of learning things, and if you attend to those ways the child learns quite easily; but if you try to make it learn your way, then, of course, the child finds things hard. I fancy, added the Wise Man, that this book is mostly written by men who have children of their own, and who have learnt from those children how to teach them; and when you find something too hard, the reason will be, not that you are stupid, but that we have not learned our lesson quite well enough. The whole secret of all teaching, everywhere, always, is to understand, if you can, the mind of the person who is to learn.

WHAT DOES ENCYCLOPÆDIA MEAN?

This is quite an easy question, even though the name of this book is longer than any word in it. *En* means *in*, and is added to make the word stronger; indeed, the word is often used without the *en*, and just written *cyclopædia*. Then the next part of the word comes from the Greek word *cyclos*, a circle, and tells us that the book is not about one thing only, but goes all the way round knowledge. And the last part of the word is just the English form of a Greek word *paideia*, which means teaching or instruction. So this book is a circle of teaching.

But, since you ask me, I think the name is better even than it looks, and that perhaps this is the only kind of book that ought to have this name; for the word that means teaching comes in Greek from another word, *pais*, which means a child, because, of course, teaching suggests a child, and a child suggests teaching. So the very word tells us that it has something to do with a child. There is a long English word for schoolmaster made from Greek, and it begins with *paed*, which really means the *man who drives a child;* but the word is so ugly, and gives such an ugly idea of a schoolmaster, that we need say no more about it.

WHAT ARE OUR EYEBROWS FOR?

This is an easy question we ought all to know the answer to, yet many grown-up people could not tell you. There are two good reasons why we have eyebrows. One is a reason of use, and the other a reason of beauty. In the first place, if we had none, the drops of sweat that form on our foreheads when we get warm would run into our eyes; and this would be bad, not only because it would blur our seeing, but also because sweat is really poisonous and a thing to get rid of, which is one of the best reasons for washing.

Now, our eyebrows catch the drops of sweat, and turn them aside. That is quite a good enough reason in itself, but there is another. The eyes are the most beautiful and interesting part of

our faces, not only from their form, but also because they and the eyelids move so quickly, and so give the idea of life. That is why a face looks so different when the eyes are shut. Now, the eyebrows are not only beautiful in themselves, but they have the special purpose of calling attention to the eyes, just as we draw attention to a specially important word in a letter by underlining it. That is why some foolish people make their eyebrows darker than they really are; but if you have a bright and healthy mind your eyes will look nice enough without any silly help of that kind.

WHY ARE TEARS SALT?

Now, you will say that there can be no harm in having sweat in our eyes, at least a little of it, since we have tears in our eyes, and they do not hurt us. But there is a great difference.

Tears are made to wash the eyes, and there is no poison in them. In fact, if you took just the right quantity of ordinary table-salt, and melted it in perfectly pure water, you would have something almost exactly the same as tears; and we know also why it is that pure water without any salt in it would not do for tears. Quite pure water is found to injure *all* delicate living things, like the front of the eyeball, and it is not natural to the body. The natural kind of water in which every part of the body lives its life is salt water. If you melt the right amount of salt in water, you have something which men who study these things call "normal salt solution," meaning that it exactly suits every part of the body, neither exciting it nor weakening it. This normal solution, which is just the same as tears, is used when we are studying any part of the living body; and it is used by surgeons rather than pure water, and all for the same reason. So next time you help yourself to salt you will know where some of it goes, and why your body needs it.

WHAT MAKES A NETTLE STING?

The leaves of a stinging-nettle—though not those of the so-called "dead-nettle," which is a wholly different plant, though the leaves look much the same—are covered with small hairs with sharp, hooked points, that will break off when they are lightly touched. But the nettle doesn't merely prick: it *stings*. This is because the hairs are filled with an acid which gets under our skin, through the hole made by the point of the hair. This makes our skin uncomfortable. *Formis* is Latin for an ant, and this acid is called formic acid because it is found in the bodies of ants. There it probably prevents other animals from eating the ants, because it is not nice to taste. This is one of the thousands of ways in which animals and plants protect themselves from their enemies—like the poisoned tooth of the serpent, the inky stuff made by an animal that lives in the sea, so as to blind its enemies, the unpleasant and often poisonous oils found in the leaves of certain plants like the tobacco-plant.

WHY DO BEES STING?

The use of the bee's sting is exactly the same, in its own way, as the use of the nettles' stinging hairs. The sting is really a fine, sharp, barbed tube, through which a drop of poisonous stuff can be sent when the bee stings. It is the worker-bees that sting—those that do the work of the hive. The case of wasps is the same. A bee usually can sting only once, for the barb, which is such a nuisance to us when we are stung, prevents the sting from being withdrawn. It is torn away from the bee's body, and the bee is so injured that it soon dies. Thus a bee stings only when its position is desperate.

I think the case of the bee's sting is interesting, for it shows how completely each bee is made for the good of the whole hive. No other creatures in the world show this so well. It is actually armed with a weapon which, to be effective, has to be made so that its use kills its owner, and it is not a weapon of offence even, but of defence only, and only for extreme cases.

The lesson is that when we are stung *we* usually begin the quarrel. *We* make ourselves offensive to the bee. If we do not, it will never dream of stinging us. Lord Avebury in England, Dr. Forel in Switzerland, and many others, make friends with bees and wasps, and will let them crawl on their hands and faces, and never get stung. But, if you get out your handkerchief and attack the bee, it is bound to do its duty, even at the cost of its life, and you have to pay a price too.

The next questions begin on page 909.

WHAT THIS STORY TELLS US

THERE are many things in the world that we cannot see; there are more things, indeed, that we cannot see than all the things we can see. We cannot see the simplest kind of living creatures that share the world with us. The smallest living things are called microbes, and are so small that if we put 20,000 side by side they would not reach across a penny. These microbes multiply faster than we can think. If we had one microbe at the moment we read this, and gave it enough to eat, there would grow from it in an hour or two more microbes than there are people in the world. Microbes are almost everywhere, in our bodies and in everything we touch, and they split themselves up so that one becomes two. Some are harmful and make us ill; others keep us well; and whether we are ill or well depends upon the way we treat these little creatures that inhabit our bodies. Every one of us is like a kingdom, with invisible armies of microbes fighting for us and against us.

THE TINIEST LIVING THINGS

CONTINUED FROM PAGE 664

WE have to talk now about the simplest kinds of living creatures that we know, and about the things they do, not only because they are very interesting in themselves, but also because their life affects the story of the earth, which they are constantly changing in many ways.

These living things are extremely small; they have many names, and are often called *germs*. You have perhaps heard about germs already, as this is the name applied to these things when they make us ill, as they often do. They are then called the germs of disease. But the great Frenchman, Pasteur, who found out that some of these things often make us ill, called them *microbes*, a word which really means small life, and which tells us that we are talking about living things of very small size.

Since they so often make us ill, most people think that all microbes are evil, and that there are none which are of any use. Now, I want you to learn that really these microbes, which men discovered only in the last century, are necessary for all the life of the earth, including our own. It is only a very few kinds of microbes, really, that make us ill, and can therefore be called the germs of disease. By far the greater number of the microbes are not merely perfectly harmless to us, but we could not live without them. It is well that we should learn, as soon as possible, that these wonderful little creatures exist, and that they play a great part in the story of life and of the earth.

The first thing to learn about microbes is that they are very small—so small that unless we have some way to help our eyes we can never see them; and, indeed, some people believe that there are many microbes so small that, however much we help our eyes, we cannot see them even then.

Men, therefore, could not know that microbes existed until the invention of the wonderful instrument called the microscope—an arrangement of pieces of glass in a tube, which magnifies small things, so that we can see them. Yet even the microscope would not be sufficient alone to show us how many kinds of microbes there are, and to teach us that they are almost everywhere.

When I say everywhere, I do not mean that you can find microbes in a fire—because, of course, they cannot live there; and, also, you will not find many microbes in the air if you go far out to sea in a ship and examine the air there, but you will always find microbes in the earth. They abound in ordinary air, they are

on everything you can touch, in the house or out of doors, and they have even been found in the snow in the Arctic regions. They are to be found in all water. So, practically, they are simply everywhere—tiny living creatures, living their own lives, and, in consequence, doing things all the time. It would be very bad for us if they were all hurtful to us.

How you can watch the microbes growing from day to day

There are still a few people who are inclined to think that microbes do not exist, but that is simply because these people have never taken an opportunity of seeing them for themselves. But really this is quite easy, and there is no doubt that the little things are alive, because you can see them moving about.

It is also a very easy thing to grow microbes. You may take a few just by dipping the point of a needle in something containing them, and then you may put them into some milk—one of the best things for growing microbes in—or in a little beef jelly, or you may stroke the needle across the cut surface of a potato; and in these and in many other ways you can watch microbes growing from day to day. Of course, you cannot see the separate microbes, but you can see the colony of them as a whole, and, as different kinds have different ways of spreading, anyone who knows them can pick up the tubes in which they are growing, and say what kind of microbe a tube contains.

The wonderful little cell that does all the work of life

In some ways all microbes are very easy to understand, because they are so very simply made—that is to say, they look simple and they are very easy to describe; but then there are thousands of different kinds of them, though most of them look so much alike, and these differences must depend upon differences in the way in which they are constructed. These microbes are too small for us to see this, but, so far as we can see, they are all made very much alike.

Every microbe simply consists of one little piece of living matter, called a *cell*. That is its whole body, and does all the work of a living creature for it. Some microbes are round, and some are like little short rods; some are very thick, and some, like those which cause influenza and consumption, are very slender; but all microbes, whether harmless or dangerous, and wherever they live, consist of one cell, as it is called.

It is very important to realise that a complete living creature, which moves and grows, can do these things, even though it has no mouth or lungs or muscles. We have to learn that many of the things we do by means of many different parts of our body made specially for the purpose can be done by living creatures that simply consist of a single living cell, which, so far as we can see, is the same throughout, and in which no different parts at all can be observed.

Many names are given to microbes according to their different shapes, but these do not matter for us; and, indeed, for some reason or other, many microbes take different shapes at different times.

You could put a hundred million microbes on a nickel

When they are growing in one place, perhaps they are round or very short, but when they are growing in other surroundings, they may become long or thin. This is very likely a question of the kind of food they get, and it reminds us that the people who grow up in the slums are usually very short, while people who have good food and grow up in fresh air are generally many inches taller.

Considering the great things they do, the smallness of microbes is wonderful. A fair average size would be one-twenty-thousandth part of an inch across. If you took some of the little rod-like microbes and could place them end to end, nearly ten millions would be required to reach a yard, while a hundred millions would be necessary to cover a nickel in a single layer, and 640,000 billions to make a solid cubic inch. (You know that a billion is a million millions, do you not?).

This gives us some idea how tiny these tiniest of living things are, and we should not forget that there may be many others which are tinier still, so that we cannot even see them with microscopes, which are able to make a thing look ten thousand times as long as it really is. When a microbe has reached its full size—though that is

not much to boast of—it does not stop feeding and growing, but it splits into two. Now, there must be some reason why a living cell, which is quite strong and young, and has plenty of food, never goes on growing and growing without limit, but always after a certain point either stops growing altogether, and gets no bigger, or else splits into two cells. A great Englishman, Herbert Spencer, found out the reason.

THE WONDERFUL WAY IN WHICH ONE LIVING THING BECOMES TWO

When a thing is very tiny, it has a large amount of surface compared with the amount of stuff in it. A much larger thing has, of course, a larger surface, but as a thing gets bigger—and it does not matter in the least what you take—the size of its surface does not increase nearly so fast as the amount of stuff in it. Now, it is, of course, through its surface or its outside that a living creature gets its food, and for every living cell the time comes when its outside is not big enough, in proportion to the amount of stuff inside, for enough food to pass through it.

So, when this point is reached, a living cell must either stop growing or it must split into two cells. These two cells, you see, will have just the same amount of stuff in them that the one cell had, but they will have between them a much larger amount of surface than the one cell had, and so they will be able to get enough food to keep them going and growing. After all, it is just the same as the case of an animal like an elephant, which is very big, and must therefore have a big mouth. The surface of a living cell is its mouth, and when the inside of a cell gets too big, its surface, or mouth, does not get big enough in proportion.

WHAT WOULD HAPPEN IF THE MICROBES COULD FIND FOOD ANYWHERE

This, then, is why a living cell, like a microbe, always splits into two when it has reached a certain size, and, as this law is true of all living cells, and as all creatures are made of cells, it is one of the most important laws in the world.

The rate at which microbes grow and multiply can scarcely be believed. Starting with only one microbe, and giving it sufficient food, in only twelve hours we should have something like eighteen millions, and six hours later we should have nearly eighty thousand millions. All this would simply be the result of taking in food, growing and dividing, and repeating the process at a tremendous rate. Of course, I do not say that this ever happened, for there would never be sufficient food, and, indeed, if microbes could get enough food to multiply as fast as they are capable of multiplying, they would soon be the only kind of living things left on the earth at all. As it is, they are like the rest of us, they cannot grow unless they get enough food of the right kind, and this is far from always being the case.

Microbes grow at rates something like this when we cultivate them on purpose, and give them the kind of food they like best; and also, unfortunately, they multiply at rates like this sometimes when they attack us, and make us ill, especially in the case of people whose bodies are just suited for microbes to grow in

MICROBES ARE REALLY TINY PLANTS, BUT LIVE LIKE ANIMALS

But you must quite undertand that not many kinds of microbes can grow in our bodies at all, and that most of them are killed at once when they enter our bodies. It is also well to remember that there are certain kinds of microbes which our bodies will kill at once, if we take care of our health and live sensibly, but which may kill us if we have been doing foolish things, and so have lessened our powers of protecting ourselves from these enemies.

The various shapes of microbes, we have said, matter very little, but what does matter a great deal is the two different kinds of ways in which microbes feed, and this we must very carefully understand. Microbes belong, on the whole, to the vegetable world, rather than the animal world, but though they are really tiny plants, none of them contain any of the green matter which enables plants to live on air as well as to breathe air. Therefore, so far as their feeding is concerned, microbes are in the same position as animals. They are all compelled, like animals, to live upon food furnished them by the bodies of other living creatures.

This is the great mark of microbes—that they live upon the bodies, either alive or dead, of other living things. These may be animal or vegetable, just

as we may eat beef or bread. The great distinction between microbes is that some of them live merely on the dead remains of living things, while others will attack and feed upon other creatures, animal or vegetable, while they are still alive.

THE MICROBES THAT PLAY A GREAT PART IN THE WORLD AND IN OUR LIVES

There are long names to describe these two kinds of microbes, but these do not matter. Those which live upon other creatures still alive are not nearly the most numerous. They include those which cause many diseases in mankind, and also attack at times other living creatures, too. But here I want especially to speak about those much more numerous microbes which live on dead matter, though always matter that has once been alive. These play a great part in the world, and, indeed, we could not possibly live without them.

Consider how many countless millions of living creatures, human, animal, and vegetable, are upon the earth, and in the air, and in the sea at this moment. For untold ages this has been so. Yet, as we know, these creatures die, and those who came before them have been dying in countless numbers every day for ages past. Now, if we consider for a moment, we shall see that, if there were no means by which the bodies of all these creatures were disposed of, the earth must long ago have been heaped up with them

The truth is that life simply could not go on if there were not something at work which, all the time, is taking the bodies of plants and animals, as they die, and doing something to them, so that they simply disappear, and are got out of the way. But more than this, there is something at work which takes these bodies—in themselves dangerous and disagreeable—and turns them into simple materials which are used as food by the new creatures living at any time.

HOW MICROBES HELP TO KEEP THE WORLD FRESH AND YOUNG

We have already seen, in another part of this book, how microbes take the dead leaves in the autumn and turn them into stuff which can be used for making new leaves in the next spring. Microbes, then, are the wonderful power which do for the dead bodies of all living things what they do for the dead leaves. They keep the world young and fresh and green. It has very often been said that they are scavengers, meaning that they are like the men who empty the dustbins and keep the streets clear of all refuse. Microbes do this, it is true; but that is only the beginning of their work, and not nearly the most wonderful part of it. Far more wonderful is the way in which, living their own lives, they take things which would be disagreeable, or which, at the least, would be useless and cumber the earth, and, without noise or disturbance or any help from us, turn these things into the sources of new life.

We have to learn that there is really nothing useless in the world. Microbes are the humblest kinds of living creatures, but they are not contemptible. Without the work they do in the course of their humble and unnoticed lives, no higher form of life upon the earth, vegetable or animal or human, would be possible.

THE TINY CREATURES THAT HELP LIFE TO RENEW ITSELF FROM AGE TO AGE

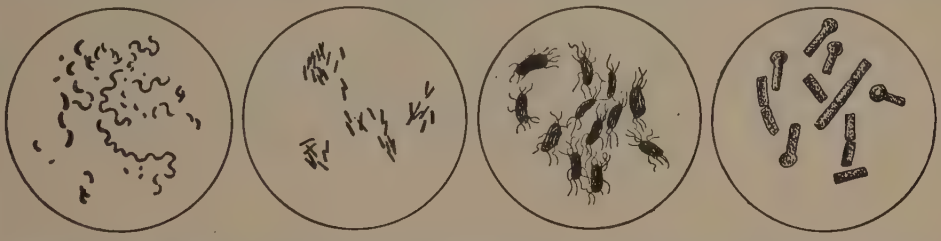
Without them the earth would long ago have become simply a heaped-up graveyard, but by their aid life can go on renewing itself from year to year, and will do so for countless ages to come. Yet these wonderful little creatures, without whose aid none of us could live here, were discovered only about fifty years ago. Things may be so small that we cannot see them, but they may yet be more important than the biggest mountain on the face of the earth; and no one knows what things there may be which no one has even guessed at, but which may be just as important as anything we know.

We can get some idea of the unceasing way in which these microbes are everywhere doing their work if we examine ordinary earth, and find how many microbes it contains. One grain of ordinary earth will contain anything from one thousand to three hundred thousand microbes, their number being greatest in earth in which many plants are growing. If you think of the thousands of microbes in a single grain of earth, and if you think how tiny that quantity is, you will begin to realise that it is not possible to say how many microbes there are in the world.

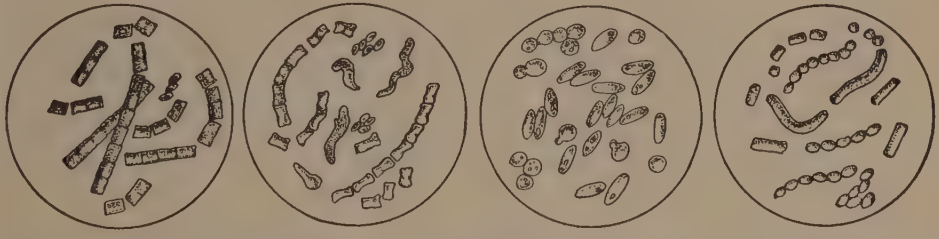
The next part of this is on page 903.

THE INVISIBLE ARMIES THAT MASTER THE EARTH

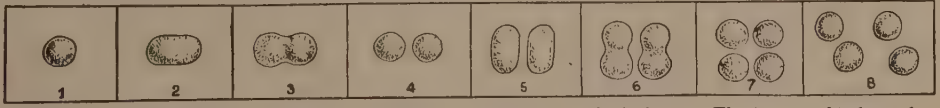
These pictures show us what is going on in our bodies almost every moment we live. Our bodies are inhabited by millions of living creatures, always fighting to make us ill or keep us well. In the first circle we see the little white things, called phagocytes, that live in our blood and keep it pure; in the second we see them devouring microbes which do us harm. The third circle shows the growth of a microbe. The small rings are the seeds, which grow together like a little stick and split up. The long, thin things that are growing out of them are the things they move with, what we should call legs and arms. The last picture shows what a colony of microbes looks like. and we see separate microbes going out to form other colonies.



This is a row of our microbe enemies, shown 1,000 times bigger than they really are. The first are the microbes that cause cholera, the second cause consumption, the third cause typhoid fever, and the last cause lockjaw. These powerful creatures are so small that 140,000 could be placed side by side on a line as long as a pin.



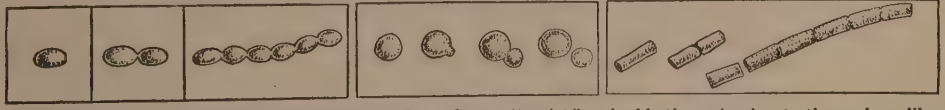
This is a row of our microbe friends, shown 1,000 times bigger than they really are. The small microbes at the top in the first circle make milk sour; those below help to make butter and cream. In the second circle are the microbes found in yeast, which make alcohol; in the third is the microbe that makes vinegar; and in the last circle is a microbe that helps to make cheese. We could not live without such microbes as these.



A microbe beginning	About five minutes later	After 15 minutes	It grows into two	Both begin to develop	Both form "waists"	The two become four	At the end of an hour

Microbes cannot be seen without a magnifying glass, but we can watch them working with a microscope.

THE WONDERFUL WAY IN WHICH MICROBES ARE BORN WHILE WE LOOK AT THEM



These pictures show the way microbes grow. Some form a "waist" and add other microbes to themselves like a string of beads. Others form buds, which break off and become separate microbes. Others join together in long rods and break off afterwards. And so these little creatures grow, more quickly than any man can count. In 24 hours, if they all lived, the children of one microbe would form a line reaching many hundreds of miles, and if the microbes were as big as shown here this line would be long enough to go 20 times round the earth.

MRS. MARTHA WASHINGTON

This is a picture of Martha Washington when a young woman. She was married at seventeen to Daniel Parke Custis, a wealthy Virginia gentleman, and was left a widow when only twenty-five years old. Two years later she was married to George Washington, with whom she lived forty years. This picture shows better than pages of description the kind of clothes a wealthy colonial lady wore. Notice the rich silks and laces, and the simple method of wearing the hair. Later the fashion changed and became more elaborate. Mrs. Washington was always a devoted wife. During the years of the Revolution she often spent the winters with Washington in his camping quarters, undergoing inconvenience and privation even, to be near her husband. The soldiers had no firmer friend than the wife of their General. Everywhere Mrs. Washington went she made herself dearly loved, and later, when her husband became President of the United States, she stepped very gracefully into the position of the first lady of the land. When she died the whole nation united in doing her honor.

FIVE FAMOUS PRESIDENTS OF THE UNITED STATES

GEORGE WASHINGTON

ON February 22, 1732, in an old fashioned Virginia homestead overlooking the Potomac River, a baby boy was born who was to alter the whole history of a nation. The name of that boy was George Washington. His father was a wealthy Southern planter, and the lad grew up on the big plantation, receiving a simple schooling in the three R's from the village sexton. George early displayed a liking for military things and organised his boy comrades into armies and regiments, conducting many a sham battle. His brother Lawrence, who was fourteen years his senior, contributed to the younger boy's love of fighting by enthusiastic tales of scenes in which he had taken part in the war between England and Spain. This big elder brother was all that George admired and hoped to be, and he resolved that when he became a man, he was going to be "just like brother Lawrence." His father died when he was twelve, and when he was fourteen, it was Lawrence who procured him a midshipman's warrant to enter the navy. Filled with eager excitement, George packed his chest and prepared to go to sea. But at the last moment his mother's tears and persuasions turned him from his cherished plan, and he gave up all idea of becoming a sailor. Hiding his disappointment as best he could, he returned to school and applied himself diligently to the study of arithmetic and surveying.

When he was but sixteen, the real work of Washington's life began. He was placed in charge of the survey of the estate of Lord Fairfax in the Shenandoah Valley. With but one companion, another young lad by the name of George Fairfax, he started out on horseback to ride to Shenandoah Valley, a distance of one hundred miles through the forest. Upon their return to Mt. Vernon, Lord Fairfax was so much pleased with Washington's work that he had him appointed a public surveyor. For the next few years the young man's life was an exposed, yet a healthful one, spent largely among the Indians in the forests. He was gaining a self-reliance and knowledge of our country that was to stand him in good stead in the days to come.

There soon came to Washington an opportunity to prove his pluck and perseverance. For years there had been a dispute between the French and the English as to the rights of each

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nation to occupy the Ohio Valley. The French were invading the country that the English claimed belonged to them. It was decided to send a trusty messenger to the French commander from Governor Dinwiddie to remonstrate with him for building forts upon English land. All eyes turned to young Washington who was making a name for himself throughout the country. He eagerly accepted the task. A journey of one thousand miles through a trackless wilderness in the dead of winter was an undertaking to cool the ardour of the most courageous; but Washington with a little party boldly plunged on through dark forests, over steep snow-bound mountains and swollen rivers, until the end of his journey was reached. Upon receiving the French governor's answer, the little party turned homeward. The horses soon became too weak to stand, so leaving them behind, Washington pushed on ahead with a single companion — their packs strapped to their backs, and their guns in their hands. Upon reaching the Allegheny River, which they had expected to cross on the ice, they found to their dismay that it was broken up and filled with whirling, grinding blocks of ice. With one hatchet between them, Washington and his companion managed to build a rough raft. Desperately they struggled with the swirling current and the floating ice cakes. As they reached the middle of the stream, the raft suddenly heaved and Washington was hurled into the icy water. Instinctively he clutched a log and by the greatest effort managed to reach a nearby island. Here the travellers tramped back and forth through the long darkness of night, their clothes stiffening to ice as the bitter wind searched them out.

When morning came they crossed to the other shore, and from there they hurried on to Williamsburg to deliver to Governor Dinwiddie the letter from the French commander. This courage was characteristic of Washington's whole life. He never flinched when there was a hard task to be done. In the French-Indian war that followed, his bravery won for him the rank of lieutenant colonel.

In 1759, he resigned from the army to marry the beautiful young widow, Martha Custis, to whom he had lost his heart upon first sight.

Many years of married happiness passed on his broad lands at Mt. Vernon before our country again called Washington to the front.

For some time the colonies had been in a state of fermentation over their treatment by Great Britain, and the Stamp Act of 1765, followed in quick succession by the "Boston Tea Party," and the Battle of Lexington, plunged the whole country into a state of great excitement. It was resolved that an army must be raised to defend the rights of the colonists. A leader was necessary. With one impulse the people turned to the man who had never failed his country or his friends in time of need. On June 5, 1775, Washington was unanimously elected commander-in-chief. On July 3, amidst the shouting of the multitude and the roar of artillery, Washington took command of the army.

It has never been known, — it can never be realised what that great man bore in the terrible years of privation and battle that followed. The soldiers he commanded were brave and patriotic, but they were thoroughly undisciplined. Yet, they had to meet the deadly fire of the King's regulars, and it sorely tried their General's heart to see how dearly they must pay for their experience and training as an army. Ammunition and firearms were scarce; food and clothing were almost unobtainable. During that winter of horrors at Valley Forge, many of the soldiers had to go about their duties barefoot, leaving blood tracks behind them in the whiteness of the snow. The piteous, uncomplaining courage of these poor fellows wrung tears from the man who had said of the battle roar, "I heard the bullets whistle, and, believe me, there is something charming in the sound."

One day a Quaker farmer was passing through the winter woods at twilight. Suddenly he heard a voice

VIRGINIA HOMES OF OUR PRESIDENTS

Here is a picture of Mt. Vernon, the home of George Washington. It was here that young George spent most of his boyhood days, and when he grew to be a man, it was here that he brought his young bride. At the close of his two terms as President, Washington returned to Mt. Vernon to spend the remainder of his days.

Monticello was the home of Thomas Jefferson, our third President. Jefferson kept open house in the manner of a Virginia country gentleman. He was almost ruined by entertaining so much, and got very deeply into debt. His friends raised enough money to help him out of his difficulty, but he did not live long afterward to enjoy his financial relief.

speaking, and following the sound, he came upon the great commander upon his knees in the snow, his cheeks wet, his voice pleading brokenly for his country and his people. The farmer returned to his home, his eyes dark and solemn with conviction. "George Washington will succeed," he told his wife, "George Washington will succeed. The Americans will secure their independence!" "What makes thee think so, Isaac?" mildly inquired his wife. "I have heard him pray, Hannah, out in the woods to-day, and the Lord will surely hear his prayer. He will, Hannah; thee may rest assured He will." And He did. The American army, under its idolised commander, spurred itself to remarkable deeds of endurance. Battle fields, where defeat seemed inevitable, were turned to victories under the wonderful generalship of this leader of men, — until the war that had started out so hopelessly for the American colonists ended in the surrender of Cornwallis and the whole British army of over 7,000 soldiers. America was a free nation.

On December 28, 1783, Washington offered his resignation and retired once more to his home in Mount Vernon, but he was not to be allowed to remain in peaceful obscurity. The young nation needed a president. There was but one man who could fill the place. On April 30, in 1789, Washington's inauguration took place. For eight years, two terms of office, he successfully guided the nation in ways of prosperity and peace; and then, refusing a third term, he retired for the last time to his old home at Mount Vernon to enjoy the rest he so well deserved. One day in 1799 when Washington had returned from a long ride around his plantation, he complained of a sore throat. The next day the great man lay dying, his household gathered around his bed. The doctors were doing all in their power to prolong his life. With his usual dignified courtesy, he addressed them. "I feel I am going," he said, quietly, "I thank you for your attentions, but I pray you to take no more trouble about me."

When the news of Washington's death was announced, the whole civilised world joined with the United States in mourning the passing of a truly great man.

THOMAS JEFFERSON

Although no man could ever take Washington's place in the hearts of the people, the third President of the United States, Thomas Jefferson, was so widely loved throughout our land that he won for himself the name of the "Friend of the people." Born in 1743 near Charlottesville, Va., he received very little schooling as a boy, and became, like Washington, a surveyor, enduring the hardships of the pioneer life. He was so fond of books and learning that he prepared himself for college. Bashful, yet warm-hearted and eager for information, it was not surprising that Jefferson made many friends for himself in his college life. Some time later he wrote: — "I had the good fortune to become acquainted thus early with some characters of very high standing and to feel the incessant wish that I could ever become what they were."

When he was twenty-nine years old, he married a pretty young widow of twenty-three and carried her off through a blinding snow storm to his beautiful home, called Monticello. They reached the house worn out and hungry, only to find that the servants had given up expecting them, and had retired for the night. The darkies quickly gathered around, delighted to welcome their dear "Massa" and his young bride home. Fires were kindled, refreshments spread forth on snowy cloth, and soon the house was alive with the merriment of joyous hearts.

So genuinely kind was Jefferson, so fair and true was he in his dealings with all classes that his friends were devoted to him, his enemies respected him and his slaves adored him. "His reputation and popularity was hardly inferior to that of Washington," says Morse.

True politeness, springing from a warm heart, ruled all of Jefferson's words and actions. One day he and

his grandson were out riding together. A passing negro bowed to them. The young man did not notice the salutation, but Jefferson courteously returned the bow. "Would you permit a negro to be more of a gentleman than yourself?" he sternly asked his grandson.

Mrs. Jefferson died while still a young woman, leaving her husband with three little girls to care for.

Slowly through the numbness of his grief, there stole to him an inexpressible consolation in the soft arms and sweet sympathy of his little daughter, Martha, the eldest of his children. Gradually he came to take a renewed interest in life, although no one ever entered the place left vacant in his heart, by the death of his "dear, dear wife."

After five years spent in France as minister plenipotentiary, Jefferson set sail for America where he was appointed Secretary of State by President Washington. Later he became Vice President under Adams. Upon the close of Adams' term of office, Jefferson was elected President of the United States. On March 4, 1801, he hitched his horse to a fence and entered the Senate Chamber to deliver his inaugural address. With Jefferson's administration there began an era of "republican simplicity." He believed in plain clothes, in simple food and simple manners. On the fourth of July and the first of January he threw the White House open to the public, but he declined to hold the weekly levees that had formerly been the custom. As a leader he was most lenient and just. One interesting incident is told of him that well points out the character of the man. While riding he met a stranger who bitterly railed against the President.

"Do you know Mr. Jefferson personally?" he was mildly asked.

"No, nor do I wish to," the man replied, violently.

"But is it fair to repeat such stories about a man and condemn one whom you do not dare to face?"

"I shall never shrink from meeting him if he ever comes my way."

"Will you then go to his house tomorrow and let me introduce you to him, if I promise to meet you there?"

"Yes, I will."

The next day, to his unbounded astonishment, the stranger learned that he had been talking with the President himself. So struck was he by Jefferson's charming personality and fairness of mind that he became the President's firm friend and supporter ever afterwards.

For the seventeen years following his retirement from office, Jefferson lived at his home, Monticello, which became a resort for all the great and noble minds in the country. But this keeping open house to all who came nearly ruined Jefferson financially. To his great grief he was forced to sell his library, which he had been collecting for over fifty years. The money thus obtained was but a temporary relief. Some friends heard of his difficulties and raised the sum of $18,000. Jefferson was greatly touched by this proof of the loyalty and affection of his countrymen, but he did not live long to enjoy the relief thus given him. He was now, as he said, "Like an old watch, with a pinion worn out here and a wheel there, until it can go no longer."

On July 4, 1826, after a short sickness, he went quietly to sleep and so drifted into death. On Thomas Jefferson's tombstone are engraved these words:—

Here was buried
Thomas Jefferson
Author of the Declaration of Independence
Of the Statutes of Virginia for Religious Freedom
And Father of the University of Virginia.

Putting aside the winning personality and lovableness of the man, there are two things alone that would give Thomas Jefferson his niche in American history. He was the "Pen of the Revolution" and wrote for us the Declaration of Independence; and it was during his administration as President, largely owing to his influence, that the purchase of Louisiana was successfully accomplished.

ANDREW JACKSON

Andrew Jackson was the son of Irish parents who had emigrated to America. He was born on the 15th of March, 1767, shortly after the death of his father. A scene taken from his early boyhood gives the keynote of the life of the child who was to become General Andrew Jackson, — the seventh President of our young Republic.

He stood in the midst of a group of older boys, his fists doubled, his blue eyes blazing. "Don't dare to touch my things!" he said hotly. The older lads stepped back amazed at the sandy haired little fury that confronted them. "If you ask me for my things," the child went on, "you may have them, but you *shall* not touch them without my leave." "Touchy," sniffed the others, disgustedly, but they left the little fellow's playthings severely alone after that lesson. "I could throw him three times out of four, but he would never stay throwed," one of the "boys" said of him long afterwards. "He was dead game even then, and never *would* give up."

When news of the battle of Lexington reached him, the child was furious because the British were making the Americans suffer. Fastening a steel scythe to a pole, he stamped round and round their little log cabin in a fury, mowing down the tall weeds on every side. "Out with the tyrants," he shrilled. "Oh, if I were only a man, I would sweep the British off the face of the earth with my grass blade!"

Times became more and more troubled all over the country, and presently Andrew, and his older brother Robert, joined the army as scouts. Not very long after they were taken prisoners by the British. One of the Redcoat officers commanded the lads to clean his boots. They both refused. "Sir," said Andrew, proudly speaking for them both, "I am a prisoner of war, and demand to be treated as such." "I never heard such insolence," fumed the British officer. "Black those boots instantly!" "I am not a servant to any Briton that breathes," he returned, coldly. Thoroughly infuriated the British officer rushed upon the boy, striking at him with his sword. Instinctively Andrew raised his hand, and the blow aimed at his head cut his finger to the bone. His hand bore the scar to the end of his life. Shortly after Andrew's mother secured the release of her two sons; but Robert died in her arms two days later of smallpox contracted in the British camps. Andrew also was attacked by that dreaded disease, but after a long and dangerous illness was finally saved. His brave little mother died herself soon after from ship fever caught while tending the sick upon the Charleston prison vessels.

Andrew was now an orphan at the age of sixteen, alone and penniless in the big world, — but the boy was a fighter born. No circumstances, however sad and hard, could vanquish his brave spirit. He found a home in the family of a distant relative, where for a while he worked as a saddler; then for a short time he taught school. Finally he began to study law at Salisbury under Mr. Spruce McCay, a well known lawyer of that time. Many years later, speaking of this time of his life, he said, "I was but a raw lad then, but I did my best." That was the secret of his success. Always he did his best.

When twenty-one he was appointed public prosecutor of the Western District of North Carolina, later a portion of the State of Tennessee. Soon he began to be widely known throughout the country as a rising man, and when he was twenty-nine years of age, he was selected by Tennessee to be one of her representatives in Congress.

In the meantime he met in Nashville the little dark-eyed woman, Rachel Robards, who was to become his wife. It is said that history does not record a happier marriage. To the world he was overbearing and harsh, and was often profane; but with her he was patient, gentle, and courteous, and when he won renown, she was happy for his sake.

In the autumn of 1797 Jackson was chosen as a Senator, and a year later he resigned his office. But he was too prominent a man to be allowed to remain a private citizen, and was elected

to the judgeship of the Supreme Court of Tennessee not long after. Six years later he resigned this post to become Major-General of the State Militia. As there was no war in progress, he continued to practise law and also opened business as an Indian trader. So great was his reputation for honesty that once when a citizen of Tennessee requested a loan from some Boston bankers, backed by a paper signed with two prominent names, they asked "Do you know General Jackson? Could you get his endorsement?"

"Yes, but he is not worth one tenth as much as either of these men whose names I offer you," objected the man.

"No matter," returned the Bank officers, "General Jackson has always protected himself and his paper, and we will let you have the money on the strength of his name."

But honest and lovable as Andrew Jackson was, his fiery temper led him into many rash acts that hurt his career, At one time, indignant at a supposed insult, he challenged a prominent man by the name of Charles Dickinson to a duel, and shot him dead. Many were the bitter enemies Jackson made by this hot-headed deed. But withal he was very tender in his dealing with the young and weak. The following story is told by the Hon. Thomas H. Benton in his "Thirty Years' View."

"I arrived at his house one wet, chilly evening in February, and came upon him in the twilight, sitting alone before the fire, a lamb and a child between his knees. He started a little, called a servant to remove the two innocents to another room, and explained to me how it was. The child had cried because the lamb was out in the cold and begged him to bring it in, which he had done to please the child, his adopted son, then not two years old. The ferocious man does not do that, and though Jackson had his passions, they were for men and enemies — those who stood up against him — and not for women and children, nor the weak or helpless; for all of whom his feelings were those of protection and support."

It was during the Creek Indian War that Jackson won for himself the term of "Old Hickory," which grew to be a name of endearment among his soldiers, for they would proudly tell each other that the general was "tough as Hickory," and could be depended upon just as surely. Later Jackson served in the war of 1812, gaining for himself much renown and an undying name for fairness to his foes and bravery in battle.

In 1824 Andrew Jackson was among the candidates for the presidency, but, owing to the enemies won by his hasty temper, he was defeated in favour of John Quincy Adams. On Dec. 23 Rachel, his beloved wife, died, leaving her husband utterly stunned and broken-hearted over his loss. For years he was inconsolable, and until the end of his life he wore her picture upon a chain about his neck. There was no other woman in the world for him. When he came to the Presidency in 1829 he provided the White House with no mistress, and during his eight years of residence there the gentle face of his wife was the last thing upon which Jackson looked at night. It was the first thing upon which his eyes rested in the morning.

Jackson served two terms as President, and upon his retirement from office he returned to his home, The Hermitage, to spend the remainder of his days among his own people. "The people of Nashville met him with outstretched arms and tearful faces. He was seventy years old, *their* President, and he had come home to live and die with them." Eight years later one Sunday, June 8th, 1845, the family and servants gathered in the sick room of Andrew Jackson. They were weeping bitterly; but peace was written in the face upon the pillow. The spirit of the fiery, great-hearted man was at rest. He was going — home, — to *her*.

ABRAHAM LINCOLN

Abraham Lincoln! Speak the name reverently. No greater hearted man was ever born into this world of change than Abraham Lincoln. Second to none, no, not even to George Washington, he stands a giant in the history of the United States of America. Yet he began life with no advantages of any

kind. All that he gained, all that he made of his life, he wrested from it by the force of his will and the firmness of his purpose. He first saw the light one cold February morning of 1809 in Kentucky in a little log cabin. The cabin was a ramshackle affair, the clearing in which it was built was rank with weeds; the acre or so of corn that stretched away to the woods was choked with high grasses and creeping vines. Shiftlessness was written in big letters over the unkempt garden and on every sagging log in the cabin walls. Abraham's father was a carpenter, but he neglected his trade to spend his time wandering about the woods, his gun in his hands, his dog at his heels. To Mrs. Lincoln was left almost the entire care of the little clearing, and to the wonderful energy and brave cheerfulness of this woman, Lincoln owed the incentive of his life. "God bless my mother," he said in later years. "All that I am or ever hope to be, I owe to her." When a log school house was opened in the neighbourhood, it was Mrs. Lincoln who wished to send her children to learn the alphabet and master the spelling book. Mr. Lincoln grumbled, but the mother had her way. Her little son and daughter attended the school so long as it was open. Often she gathered the children at her knees. "You must learn to read and write," she said wistfully, a gaunt, toil-worn hand upon each upturned little head. "You must get knowledge, so that when you grow up you will be wise and good."

Lincoln's father was of a wandering disposition, and when Abraham, or Abe, as the boy was called, was seven years old, he moved his family to a farm in Indiana. Here in the late autumn they selected the spot for their new farm, and father and mother and little son all set to work, with axes in their hands, to make a clearing in the wilderness for their new home. Winter was almost upon them, and with more haste than care, they built themselves "a half-faced camp" of logs.

In the autumn of 1818 a strange sickness broke out all over the countryside, killing men and cattle by the dozens. Mrs. Lincoln was among the ones stricken. A week after she was taken ill, her husband and little son with breaking hearts built the rough pine coffin for the wife and mother who had loved them so well and served them so faithfully. A winter of dismal loneliness descended upon the Lincoln family. The children missed her piteously. Often their father was away for long hunting trips, leaving them alone in the cabin in the wilderness. Night would find the two huddled together against the cabin wall, their arms about each other, their ears straining for the sound of footsteps that did not come, and hearing only the dismal howling of the wild animals that prowled about in the darkness. It was a happy day for them, when, in December, their father brought home a new mother, with her son and two daughters. At first the Lincoln children hung back shyly from the newcomers. But the sweet motherly ways of the new Mrs. Lincoln soon won their hearts. She was a very capable woman. It was not long before she had the disorderly cabin spick and span. She brought with her some new furniture and a goodly array of bright pots and pans, and soon the place was fairly shining with a sweet wholesomeness and comfort it had never known before.

When Abraham was eleven years old a school house was built not very far from their home, and the question again arose whether the boy should be allowed to attend. His father contended that a big, able-bodied boy like Abe was of more use on their little farm than he could ever be at school; but his new mother said, "No, the boy must be given an education." Abraham went to school and this was the beginning of his love for books. The boy's school life was an irregular one, for he was much needed on the farm; but he never let an opportunity slip to read everything on which he could lay his hands. Many weary miles Abraham travelled to borrow books. After his day's work was ended he would read as long as it was light, then, lying on the floor in front of the

fireplace, with the aid of the glowing coals, he would read on into the night, often writing his compositions on a wooden shovel with a piece of charcoal. When the surface was covered he was sometimes obliged to shave off the first part of his work to make room for the last.

At nineteen, Lincoln started into business for himself, trading with a flat boat up and down the Mississippi River. It was not long after this, that the Lincoln family once more started on the trail. This time they moved to Illinois, where Lincoln went into business as a clerk in charge of a store in New Salem. When the Black Hawk War opened in 1832, he was elected captain of a company. Lincoln's public career began at the close of the war. For a time he served as postmaster in New Salem, using every spare minute for the study of law, and in 1836 he was admitted to the Bar. About this time he "was a tall, gawky looking fellow, wearing a wide-brimmed straw hat without a band, a homespun shirt and claw-hammer coat, and tow trousers that did not meet his shoes by several inches." Strangers felt when they looked at him, "This man is a clown." The moment he opened his mouth to speak, all consciousness of his uncouth appearance vanished from their minds. Here was a man who dealt with souls. So much confidence had the people of Illinois in the young lawyer that they elected him to their Legislature, and in 1847 they sent him to Congress as one of their representatives.

For several years after his return from Washington he devoted himself entirely to the practice of law; but in 1854, when the entire country was roused over the Kansas-Nebraska Bill regarding the admission of slave states to the Union, Lincoln again came to the front and took an active part in public affairs. He protested that "slavery is founded on both injustice and bad policy." Then followed the famous debates between Lincoln and Stephen A. Douglas, the "Little Giant" of Western politics, upon the question of Slavery.

In 1860 Lincoln was nominated for the Presidency and was elected in November. Upon the news of his election the long expected division of the nation upon the slave question occurred. Eleven States seceded from the Union, and the country made ready for war. On the 11th of February, 1861, Lincoln spoke a few words of farewell to his own people, and with a sad heart turned toward the capital, "to assume a task more difficult than that which devolved upon Washington." The outlook was indeed a gloomy one. The Civil War opened with the firing upon Fort Sumter by the Confederates of the South, and the years that followed were full of trial and terror to the nation. Steadfast amid the clamour of his foes he held to his purpose and policy to unite the North and South. But while the President toiled in the executive office, his heart was bleeding for his fellow countrymen who were falling by the thousand in the field of battle, sorrowing even as a father in the sorrows of his children. He had but one thought through all those dark years, — *the preservation of the Union.* "If I could save the Union without freeing any slave," he wrote a friend, "I would do it; and if I could save it by freeing all the slaves, I would do it; and if I could save it by freeing some and leaving others alone, I would do that. What I do about slavery and the coloured race, I do because I believe it helps to save the Union: and what I forbear, I forbear because I do not believe it would help save the Union."

On the 1st day of January, 1863, President Lincoln issued the Proclamation of Emancipation, freeing all the slaves in the Confederate States of America. In 1864 he was re-elected to the Presidency, but the pressure of public affairs became so unbearable that it seemed as if this strong man were carrying more than he could endure in heart and mind. "I think I shall hardly live out this term of the Presidency, the burden is so great," he said. Yet there was nothing of weakness about Abraham Lincoln. He faced each problem, squarely as it

came, and did his duty greatly as a man.

"Sprung from the West,
The strength of virgin forests braced his mind,
The hush of spacious prairies stilled his soul.
Up from the log cabin to the Capitol,
One fire was on his spirit, one resolve—
To send the keen axe to the root of wrong,
Clearing a free way for the feet of God.
. . . . . .
So came the Captain with the thinking heart;
And when the judgment thunders split the house,
Wrenching the rafters from their ancient rest,
He held the ridgepole up, and spiked again
The rafters of the Home."

With the sure hand of a leader of men he guided the nation into peace at last. The desire of his heart was accomplished, the Union was saved. The country went wild with joy. Bells were rung; and the people shouted the good news to each other, laughing as they told it; while prayers of thanksgiving were offered up in the churches all over the land. On April 14, 1865, Abraham Lincoln was assassinated.

At first the people could not realise the blow that had fallen upon them. They went about dazed, looking into each other's faces. "What has happened?" they asked. "What has happened?" "Lincoln — shot — by Wilkes Booth?" Then they went mad and in a frenzy clamoured for the blood of the man who had done the hateful deed. "Hang him!" they cried hoarsely, "Hang him! Hang him!" And the whole country turned loose to hunt down the murderer. Twelve days later Wilkes Booth was shot in a barn where he had taken refuge.

It was only when the first fury for revenge was over that the people came to the real bitterness of their loss. "This was a Man," they said, and choked as they said it. Of Abraham Lincoln, Robert Ingersoll wrote:— "It is the glory of Lincoln that, having almost absolute power, he never abused it, except on the side of mercy. Wealth could not purchase, power could not awe, this divine, this loving man. He knew no fear, except the fear of doing wrong. Hating slavery, pitying the master — seeking to conquer, not persons, but prejudices — he was the embodiment of self-denial, the courage, the hope and the nobility of a nation. He raised his hands, not to strike, but in benediction. . . . Lincoln was the grandest figure of the fiercest civil war. He is the gentlest memory of our world."

Ulysses S. Grant

Ulysses S. Grant was born in Claremont County, Ohio, one April day in the Spring of 1822. There was a celebration in Georgetown soon after and the streets were thronged with people who had come out to see the parade. Mr. Grant lifted the small Ulysses high up in his arms over the people's heads, so that he might see the procession. A boy passed with a pistol.

"Hello, Lyss," he shouted, seeing the baby, "Want to shoot? Let him fire it, Mr. Grant," he pleaded.

The father put Ulysses' small finger on the trigger. "Now, go," he commanded. Bing, bang, bang, went the pistol. The people near by jumped and a woman screamed, but little Ulysses never even blinked.

"Fick it again! Fick it again!" he crowed, gleefully, stretching out his small fists for the toy weapon.

"He'll make a general, sure," remarked a bystander admiringly.

Perhaps it was the remembrance of this incident that influenced Mr. Grant when the boy grew older in deciding that he should become a soldier. Ulysses was a shy lad, of retiring manners, with a love for horseflesh. He was never brilliant at school, but he was honest as daylight and very plucky.

One day his father said to him: "Ulysses, I believe you are going to receive the appointment."

"What appointment?" asked the boy, startled.

"To West Point. I have applied for it."

"But — but, I don't want to go," stammered Ulysses in distress.

"But I wish it," returned his father, decidedly.

"Very well, father," said the boy at length, "I suppose I'll go then."

Ulysses at once buckled down upon the weary work of preparation for the entrance examinations. Day after day the boy, whose only fondness was for horses and out of door life, plodded through his books. Finally the dreaded trial came. The examination was successfully passed and young Grant was admitted to West Point. The years at the military academy did not pass swiftly to Ulysses. When he first entered he was so awkward and seemingly thick headed that he was the butt of many stupid boyish jokes; but under his uncouth exterior, he was so honest and manly that before long he won the sincere respect of all his schoolmates.

When the four years at West Point were over, Grant received his appointment as lieutenant of the Fourth Infantry Regiment of the United States. In September, 1843, he reported for duty at Jefferson Barracks, St. Louis; and it was there he met pretty little Julia Dent. Lieutenant Grant soon became her devoted admirer. In 1845 he was ordered to the front in the Mexican War; and before he left, he became engaged to this little lady of the West. In the Mexican War Grant and Major Robert E. Lee fought side by side. "Second Lieutenant Grant behaved with distinguished gallantry," Major Lee reported on one occasion when the young fellow had distinguished himself. He little dreamed that the time would come when he and this young lieutenant would be leading armies against each other in a bitter Civil War that would divide the nation.

Young Grant came out of the Mexican War with a practical knowledge of military tactics that was of incalculable value to him and to his country in the years to come, and soon after his return, Lieutenant Grant married Miss Julia Dent. Hard times followed for the young couple. Grant was ordered to the Pacific coast. After six years of struggle to support a wife and two children on the pay of an army officer, Grant retired from the service. He must provide properly for his little family by some means or other. Farming, the real estate business, and tanning were all tried in turn, but each one proved more or less of a failure.

With the coming of the Spring of 1861 a great event took place which changed the history of many thousands of people in the United States, and among them that of the Grant family. For some time there had been a bitter dispute between the North and the Southern States, as to whether slave states should be admitted to the Union. The Southerners wished slaves, the Northerners did not, and the two sections nominated candidates who were far apart in their views for the presidency at this time of crisis. Lincoln was elected. South Carolina, followed by ten other Southern States, soon seceded from the Union, and war opened between the North and South.

Ulysses S. Grant was called to Springfield to take command of the 21st Illinois regiment of infantry. The regiment was a disorderly one and its former colonel had been dismissed because he could not control his men. Grant appeared on the parade ground in the suit of a private citizen, and a rather shabby suit at that. The men jeered disrespectfully. "Speech! Speech!" they demanded sarcastically. Grant quietly ran his eye over the disorderly lines.

"Soldiers," he said, in a tone that was not to be mistaken, "go to your quarters." One by one they slunk away. "Grant knows what he is about," they remarked to each other with sheepish admiration. And he did. He drilled his men, and re-drilled them, and drilled them over again, until they obeyed his least word of command. Then he led his regiment into battle. So successful was he in his undertakings, that before long he was raised to the rank of Major-General. He had already won for himself the title of "Unconditional Surrender Grant." So strategic, so successful

was General Grant in his movements against the Confederate army, that before long the whole country was ringing with the name of the man of whose very existence but a small number of people had been aware a few years back.

When the news of the battle of Chattanooga reached Washington, Congress decided that there was but one man who could lead the Northern forces to victory, — and that man was Grant. They summoned him to the Capital, and formally created him lieutenant-general of the entire army, commander-in-chief of the Union forces. No other general, save Washington, had ever received such an honour.

For three years the outcome of the Civil War had been more or less doubtful; but from now on all uncertainty as to the results was removed from the minds of the people. Battle after battle was fought in quick succession, all leading up to the last desperate stand of the Confederate army at Richmond, and the surrender of General Lee at Appomattox Court House on April 9, 1865. In recognition of his services, Congress created for Grant the grade of "General," a higher title than even George Washington received.

In 1868 General Grant was elected President of the United States, and served two terms, but he was not so successful as President as he had been as a soldier.

Upon his retirement from the presidency, General Grant set sail for Europe. Everywhere he was received with shouts and waving flags and songs of "Hail Columbia" and the "Star Spangled Banner." Lord Beaconsfield said to Queen Victoria: — "We will be doing honour to a wonderful general and pay a high tribute to a great nation if we receive ex-President Grant as a sovereign." And as a sovereign he was greeted in every land.

In Japan the Mikado took his hand; in China he was welcomed with fireworks and banners flung abroad bearing this motto: "Washington, Lincoln, Grant, three immortal Americans." Could greater honour be done to any man than this. What a contrast from this to the obscure life of a village tanner, less than twenty years before!

Yet Grant always bore his glory with the modesty of a simple-hearted man. He rendered honour where honour was due. Standing before the Tomb of Jesus of Nazareth in Jerusalem, he bowed his head. "Here slept the real warrior," he said. "He conquered the world with his love."

The old age of this great general was not a happy one. After returning to America, he settled down in New York City as a private citizen, going into the banking business. But in this business he unfortunately lost all the wealth that fortune had showered upon him. The manager of the bank proved dishonest, and Grant was again left a poor man in his old age. For a while he worked upon some magazine articles. Then, with the coming of a serious throat trouble, he set to work to write his "Memoirs." Early and late he toiled away at his hard task, until he was almost too weak to sit up in a chair, for his family must not be left penniless after his death.

One day he laid down his pen with a sigh of satisfaction. The "Memoirs" were finished. Thousands of people had subscribed for his book, — the future of his family was provided for. Only a few days later the body of Ulysses Grant was borne in state to the City Hall in New York, where thousands came to do the last honours to the great general. For a while he was placed in a temporary vault beside the Hudson. Then his body was carried to the white marble tomb on Riverside Drive, which was to be the last resting place of the "protector of our American Union."

Above the doorway of the tomb of this fighter of many battles are inscribed the words: "Let us have Peace," words spoken by the man himself, words which bear a deeper significance to our nation every year.

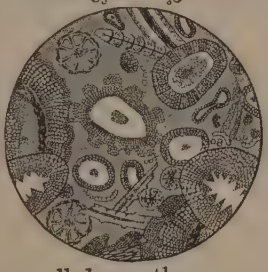
This picture shows what coal was like millions of years ago. Great ferns and trees like these grew in the forests before men began to live in the world. The sun poured down upon them, and for hundreds of years the trees drank in the sunshine. Then the trees fell and were covered with earth, and long afterwards men dug deep holes and found these trees, all turned to coal. Deep down in the earth lay the sunshine, locked up in the great forest trees, and if you will take up a piece of coal you may find upon it still the mark of a leaf that bloomed in the forest a million years ago.

HOW WE DIG UP SUNSHINE

THE STORY OF A PIECE OF COAL

CONTINUED FROM 741

POETS have sometimes called coal buried sunshine; and they are quite right, for coal is really sunshine that has been buried down in the earth for millions of years. Long, long ago, before there were any women and men and children on the earth, ferns grew as big as small trees, tall and strong and thick. The sun poured down on them all day long, and the ferns drank in the sunshine as it came to them and used it to make green leaves and stems.



This went on for a very long time, until at last ferns of that kind came to an end altogether, and their dead leaves and branches were buried. Down in the earth the bodies of these ferns began to change into something rich and strange. Sometimes, in some parts of the world, we can see the change going on still. There are places, in Scotland and Ireland and other regions where the bodies of these ferns have turned into stuff called peat, a sort of soft, wet wood, which forms great bogs, or places of wet, soft, spongy ground, where it is unpleasant to walk.

That is how the ferns changed when they were not buried. But in most parts of the world they were buried deep down in the earth, and they changed first into peat, and then into something hard and black, which we call coal.

For ages and ages this coal has laid in the earth. After the ferns had passed, great forests of trees grew and disappeared again. The waves of the sea crept slowly up to the forests as thousands and thousands of years went by, and the sea washed away the trees. For ages and ages these trees lay at the bottom of the sea, until the waves crept farther and farther across the earth and left the places dry again.

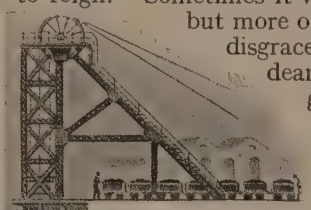
Then the wind blew the dust across the earth. Great pieces of rock fell and were covered up with new soil. Again and again this happened. In one place in England the sea and the land changed places sixteen times, and every time the sea swept away a great forest of trees, which had been drinking in sunshine for thousands of years until they were buried in the earth and turned to coal. Deep down in the earth lies the sunshine, locked up in the green leaves of the ferns and trees which have now become coal.

Coal has for hundreds of years been one of the most important minerals. Our manufactures could not be carried on without the power the heat from coal gives us. The sunshine released by burning the coal cooks our dinner and drives the machines that make the cloth

for our clothes; it carries the great ships across the sea, and the trains across the land. Is it not wonderful, then, that men should have been so stupid as to declare that no coal should be burnt as fuel?

The Romans, when they were in Britain, were wise enough to use coal, but kings who lived hundreds of years later gave orders that no coal should be used. Henry III., who was King of England from 1216 until 1272, gave the people of Newcastle the right to sell coal, and people engaged in trade began to use it. But the wealthy people complained of the smoke, so the king issued an order saying that nothing but wood should be used for fires. Edward II. was wiser. He restored the rights of the people of Newcastle to sell coal, and gave permission to the owners of coalfields in Derbyshire also to sell.

The fortunes of coal varied from reign to reign. Sometimes it was in favour, but more often it was in disgrace. Wood was dear, and always getting more scarce, of course; but, when coal was in disgrace, the people, rich and poor alike, had to burn wood or go without fires. Even Queen Elizabeth could not overcome the old notion that coal was dangerous to health. Most of her members of Parliament were country gentlemen. In their own homes in the country they naturally used wood, which was to be got without trouble. The queen thought, therefore, that, as they were used to wood fires, the smoke from the coal fires would damage their health. So, during the time that these gentlemen were in London for the meetings of Parliament, no one was permitted to burn coal.

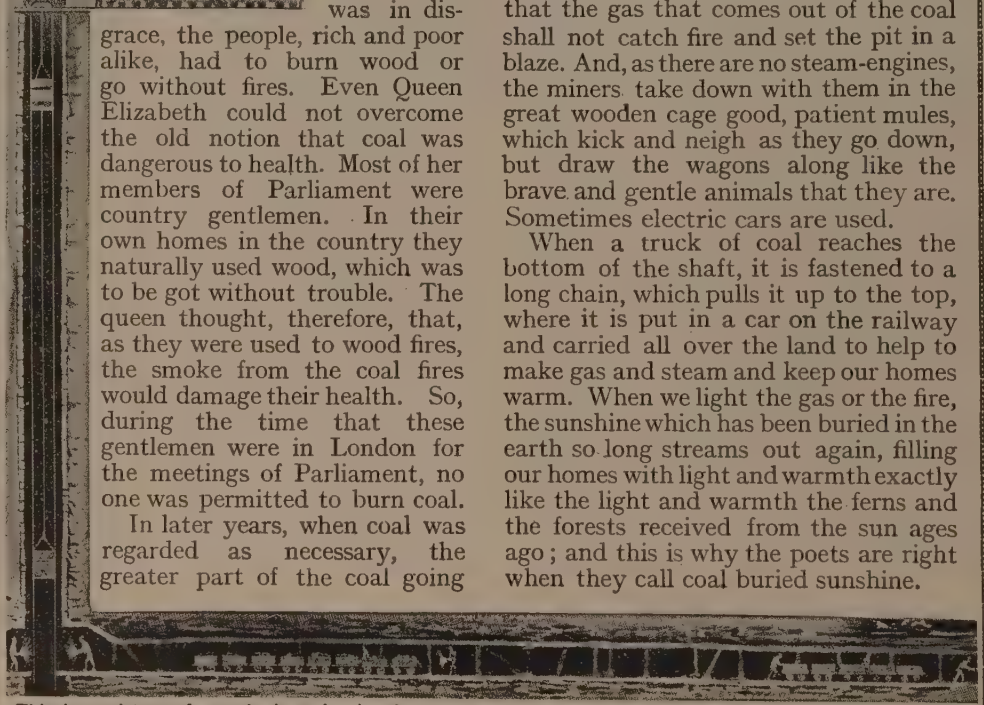


In later years, when coal was regarded as necessary, the greater part of the coal going to London was brought down the coast by sea, and all that went up the Thames was taxed. But Oliver Cromwell had many cargoes of coal carried in free from tax, so that the poor might get it cheaply. Also, he made the city companies store coal in the summer, when it was cheap, for the use of the poor in winter. It would be a blessing to the poor if men who have the power would do something of the same sort nowadays.

It is not a simple task to get the coal. The pictures in the following pages show us how it comes to us.

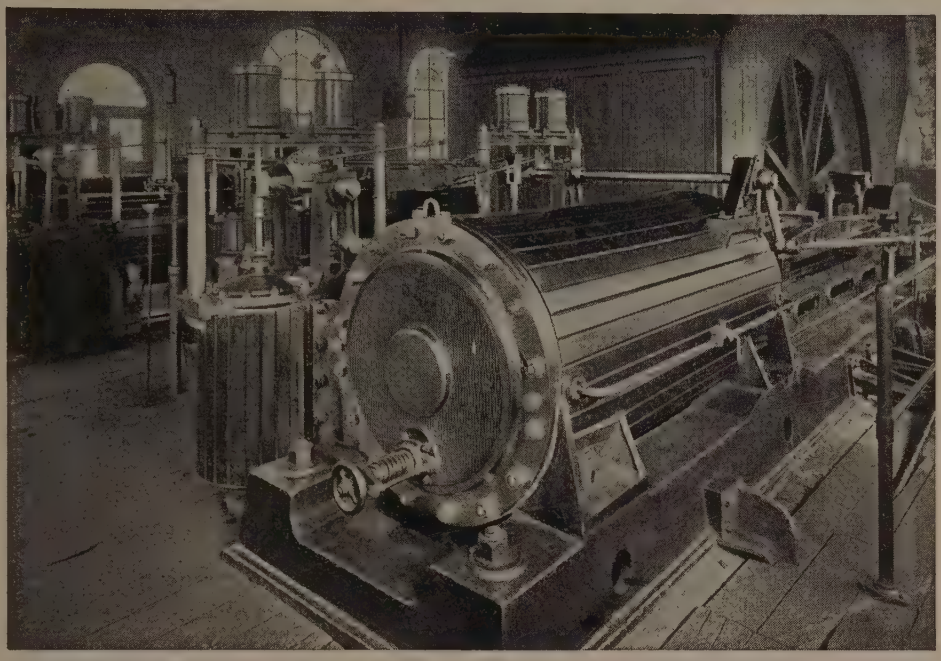
We dig great holes called shafts in the earth, deep, deep down—longer, perhaps, than the street you live in, and send men down in great wooden cages with picks and shovels to take out the coal for us. All day long they work, with tiny lamps to light the way, and they dig into the coal walls all round them, making long, narrow roads, like tunnels. As the coal is dug out, it is put into little trucks, which run along little railways to the bottom of the shaft. There are very few steam-engines down the pit to pull these trucks, because the only fire usually allowed is the light in the lamp, which must generally be covered with gauze, so that the gas that comes out of the coal shall not catch fire and set the pit in a blaze. And, as there are no steam-engines, the miners take down with them in the great wooden cage good, patient mules, which kick and neigh as they go down, but draw the wagons along like the brave and gentle animals that they are. Sometimes electric cars are used.

When a truck of coal reaches the bottom of the shaft, it is fastened to a long chain, which pulls it up to the top, where it is put in a car on the railway and carried all over the land to help to make gas and steam and keep our homes warm. When we light the gas or the fire, the sunshine which has been buried in the earth so long streams out again, filling our homes with light and warmth exactly like the light and warmth the ferns and the forests received from the sun ages ago; and this is why the poets are right when they call coal buried sunshine.



This is a picture of a coal-mine, showing how the coal is dug out of the earth, how it is drawn in little wagons to the bottom of the shaft, and how it comes up to the top, where the train is waiting for it.

HOW MINERS GO DOWN IN THE EARTH



A very important part of a coal-mine is the engine-house with its engine, which turns a drum or great reel of steel wire and lets the cages up and down the shaft, so that the miners may reach the coal and send it up to us.

The miners start work by entering the cage, as shown here, ready to go down the shaft to the coal underground. A brake prevents the engine in our first picture from moving the cage up or down too quickly.

WHAT IT IS LIKE DOWN A COAL-MINE

Down in the mine there are roads like this, along which trucks take the coal from where the men work to the foot of the shaft. Great timber props are placed in position to prevent the roof falling in.

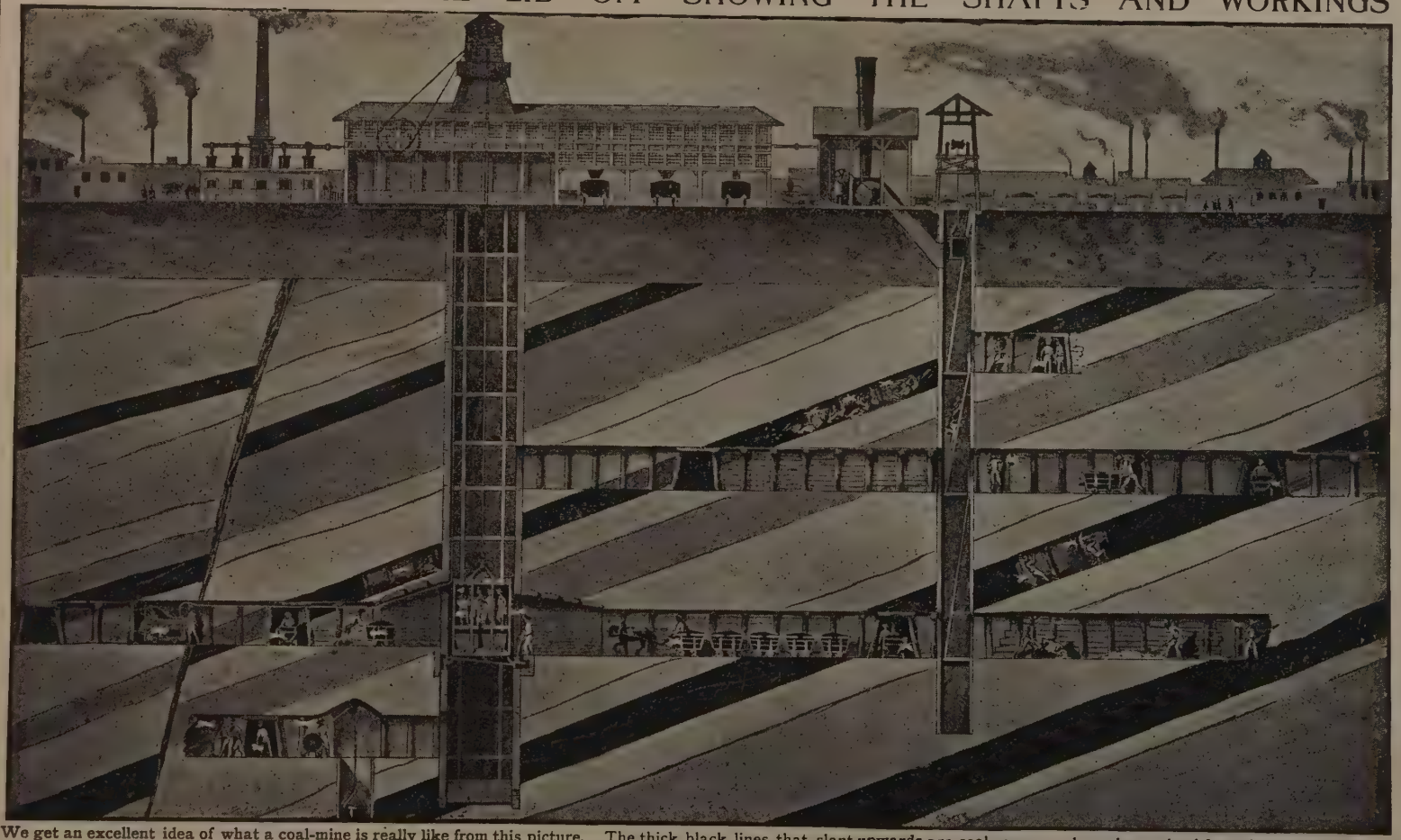
The miners work lying on their sides or backs and loosen the coal with little pickaxes. Owing to the heat they wear very few clothes. For light they use safety lamps like that which we saw on page 654.

GETTING THE COAL OUT OF ITS BED

In some mines holes are drilled in the wall of coal by a machine, as shown here. Then gunpowder or some other explosive is put in, and the mass of coal is blown to pieces. This saves much labour.

As the coal is loosened from the seam or wall, it is shovelled up into trucks like this one and taken along the passages to the foot of the shaft, ready to be hauled up. Sometimes the workings are a long way from the shaft.

A COAL-MINE WITH THE LID OFF SHOWING THE SHAFTS AND WORKINGS



We get an excellent idea of what a coal-mine is really like from this picture. The thick black lines that slant upwards are coal-seams, and roadways lead from the shafts to these.

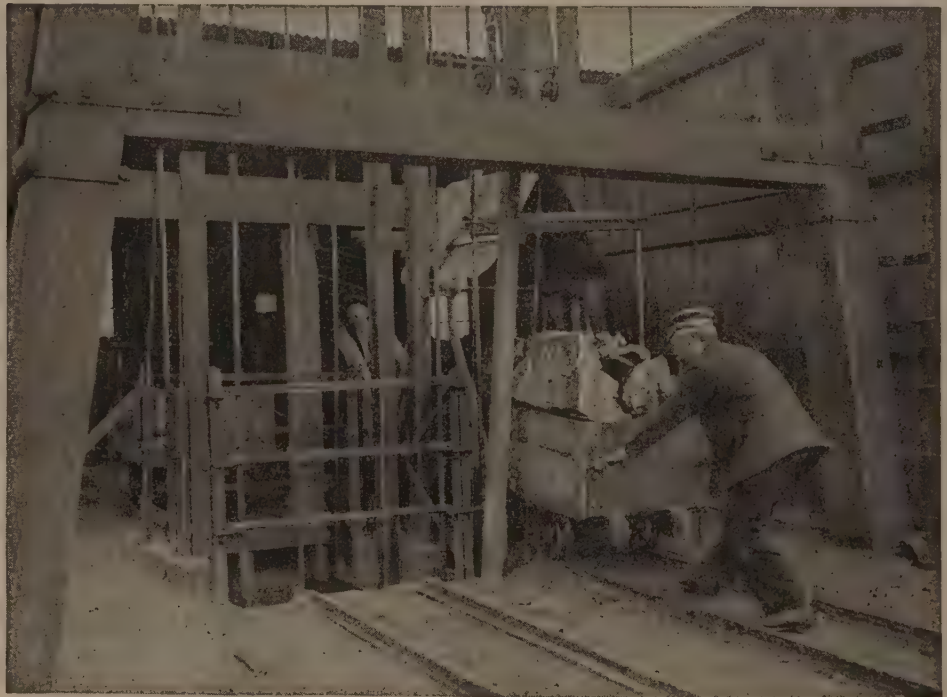
PONIES THAT LIVE BELOW THE GROUND

Thousands of ponies in England, or mules in this country, live their lives in darkness. They pull the trucks along the underground roadways, and stables are built in the mine so that they need not go up and down the shaft.

The mine ponies are very patient, hard-working animals, and, although living in such unfavourable conditions, are strong and can pull a whole train of heavily-laden trucks. This is possible because the wagons run on rails.

THE COAL COMES UP THE SHAFT

On arrival at the bottom of the shaft the loaded trucks are run into a cage, which has sometimes as many as five decks. Here we see a truck being pushed into a cage, ready for hauling to the surface.



The cage is then hauled up, and on arriving at the pit-head the trucks are run on to a line of rails and directed to what is known as a breaker, where the coal is sorted into various sizes.

THE COAL-MINER COMES BACK TO THE LIGHT

The miner spends most of his working life out of the light of the sun, and out of the real world. His calling is a dangerous one, and when the men go down to their daily work they take their lives in their hands. A gas called fire-damp forms in the mine, and if this meets an exposed light it explodes, setting the mine on fire and imprisoning the men by blocking up the passages with fallen coal. Naturally, therefore, when the men arrive safely at the top, after their day's work, their families are very glad to see them

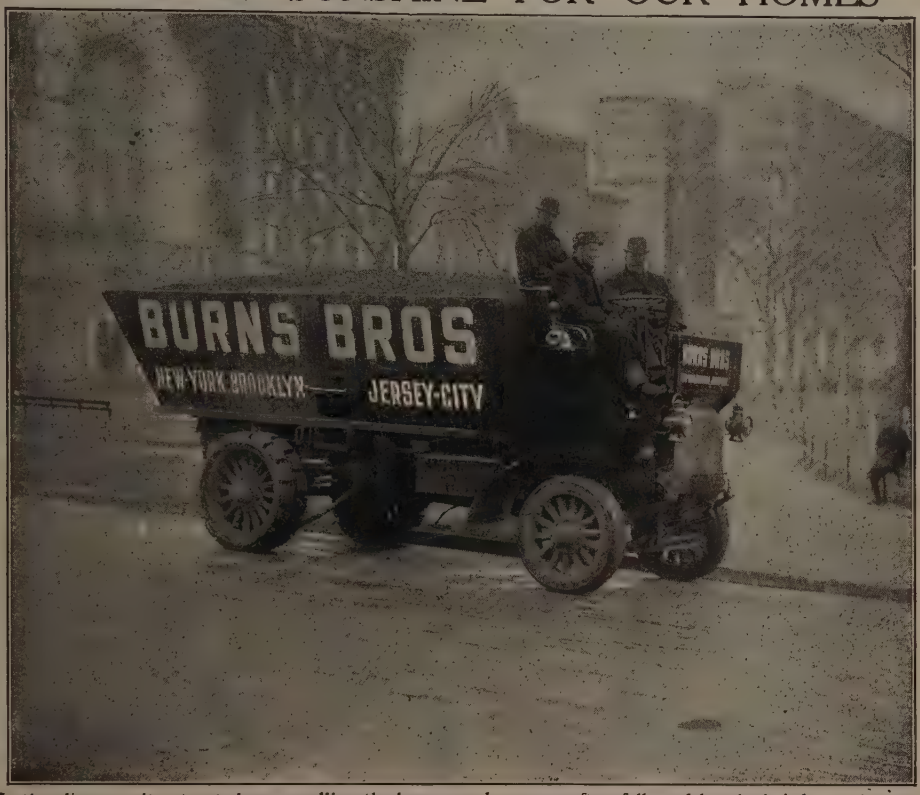
HOW THE COAL DROPS INTO THE TRUCKS

Loaded trucks from the pit's mouth ascend to the tipple, on the left-hand rails, and the empty wagons return by the right-hand track, as seen here. The coal is sifted into various sizes by falling over screens.

The tipple is built over the railway, and as the coal is sorted it is shot into cars waiting to receive it underneath. Then the cars are joined together to form a train, and the coal is taken all over the country.

Photographs copyright by H. C. White Co.

LOADS OF SUNSHINE FOR OUR HOMES



In the slippery city streets horses pulling the heavy coal wagons often fall, and break their legs. A motor truck like this can do more work than a dozen horses, and do it more quickly and better.

And at last we sit round the fire enjoying the sunshine that was buried in the earth millions of years ago. Coal fires are so good that it seems strange to us that they should once have been forbidden.

The next Pictures of Familiar Things are on page 887

THE GIGANTIC BIRD IN THE VALLEY OF DIAMONDS

When Sindbad's ship was returning from the Valley of Diamonds, he was pursued by a gigantic bird called the roc, whose egg one of the sailors had broken. The bird dropped a huge block of granite, which sank the ship. Sindbad escaped by swimming to the shore of an island near by, where he met with the Old Man of the Sea.

BAGDAD, THE CITY WHERE SINDBAD THE SAILOR LIVED

SINDBAD THE SAILOR

CONTINUED FROM PAGE 713

As Sindbad the Sailor was sitting in the mansion which he had built in the city of Bagdad, he heard a poor porter in the street say:

"Men are not rewarded according to their merit. I have worked harder than Sindbad, and yet he lives in splendour and I live in misery."

Sindbad was moved by the porter's complaint, and he invited him to come in and listen to the story of his adventures.

"Perhaps when you have learned by what sufferings I won my wealth," said Sindbad, "you will be more contented with your own lot in life.

"Look at my white hair and worn face! I seem an old man. But how young and strong I was when I sailed away to make my fortune by trading in strange countries! Soon after we departed our ship was becalmed near a little island, and we got out to look at the place. But what we had taken for an island was only the green back of a great whale

"As soon as we landed it began to sway to and fro, and then it plunged beneath the waves and left us struggling in the sea. Clinging to a large piece of wood, I was washed ashore on a desert island.

"Here I thought I should have starved. But on wandering about I found a clump of fruit-trees, and hidden among these was a great white ball about fifty feet in size. After eating some of the fruit I crept beneath the great white ball and lay down to sleep. Just as I was closing my eyes I looked up, and saw that the sky was darkened by the wings of a gigantic bird.

"'Good heavens!' I exclaimed. 'This great white ball is the egg of that monstrous kind of bird that sailors call a roc.'

"And so it was. The roc settled on the egg under which I was lying, and one of its claws, which was as big as the trunk of a tree, stuck in my dress.

"At daybreak the roc flew up into the air, and carried me to such a height that I could not see the earth. Then it descended with such speed that I nearly lost my senses. As it alighted I freed my dress from its claw, and found myself in a deep valley cut off from the world by a circle of high, steep mountains.

"It was the Valley of Diamonds! The ground was covered with precious stones. Full of joy, I began to fill my pockets with them, but my joy was soon turned to terror. The valley was haunted by great serpents, and I could find no means of escape.

"I crept into a cave and blocked up the opening with a large stone, but all night I was kept awake by the hissing of the serpents. At daybreak they retired, as they were afraid of the roc that used then to visit the valley in search of food. So I stole out of the cave, and I was then knocked over by something that came tumbling down the mountains. It was a great piece of fresh meat. As it rolled along, the diamonds on the ground stuck to it. Looking up, I saw on the mountains a band of men, who were preparing to

roll another piece of meat down into the valley.

"'I have heard of this means of getting diamonds,' I said to myself. 'It strikes me that it is also a good means of getting away.'

"I then tied myself to the piece of meat, and hid beneath it, and presently an eagle swooped down and seized the meat and carried it to its nest on the top of the mountains. The band of men drove the eagle away, and turned the meat over to pick off the diamonds that had stuck to it, and found me tied to it.

"When they had got the diamonds they needed, we all sailed for home. But on passing the desert island my companions landed with an axe and broke open the great white ball. A terrible scream rang through the sky. The roc had seen them! They rushed back to the ship, and we quickly sailed away; but the roc followed us, bearing in its claws a vast piece of granite. This it dropped on our ship, and down we all went into the sea. Holding on to a fragment of wreckage with one hand, and swimming with the other, I managed to reach another island.

"It was a delicious spot! Sparkling streams ran between vineyards full of grapes and orchards full of fruit. There I met a strange old man, who made signs to me to carry him over one of the streams. As soon as I hoisted him on my back, the old man threw his legs over my neck and squeezed my throat so that I fainted. When I came to, he was still fixed on my shoulders. There he remained all day and all night, and when I awoke next morning there he was still. He never got off.

"He made me his slave. When, in order to keep up my strength, I made some wine out of the grapes, he took it from me and drank it all up. Happily, it was too strong for him, and, releasing his hold of my neck, he fell to the ground, and I killed him.

"By the shore I met some sailors, with whom I returned to Bagdad.

"'That was the Old Man of the Sea,' they said to me. 'You are the first person that has escaped from being at last strangled by him.'

"Now don't you think," said Sindbad to the porter, "that I have earned all the riches that I brought away from the Valley of Diamonds?"

The porter agreed that he had, and Sindbad then gave him a handsome present, and he went home more contented with his own lot in life.

HOW NAPOLEON CAME FROM ELBA

He stood in front of his old veterans, a little bowed man in a grey riding-cloak, long boots, and a cocked hat, with his lips pressed against the splendid banner of France.

He was bidding farewell to his soldiers. The great Emperor, the man who had shaken the earth to its foundations, was the man who had begun life as a poor lieutenant, and in a few years had excelled all the conquests of Cæsar, Alexander, and Hannibal, and had seated himself upon a throne, and placed a crown upon his head—this man, the great Napoleon, was beaten at last, and was now going into exile, hated and scorned by the human race.

On his way to the coast where the ship waited to carry him far from France, he was cursed by the people. They ran beside his carriage and hurled stones at him. He had to put off his familiar clothes and don a disguise to escape murder. "Down with the tyrant!" they cried. So he went away—the great Napoleon, the mighty Emperor—away from France, away to a little island named Elba, which had been thrown to him like a scornful toy by the kings of the earth who had conquered him at last.

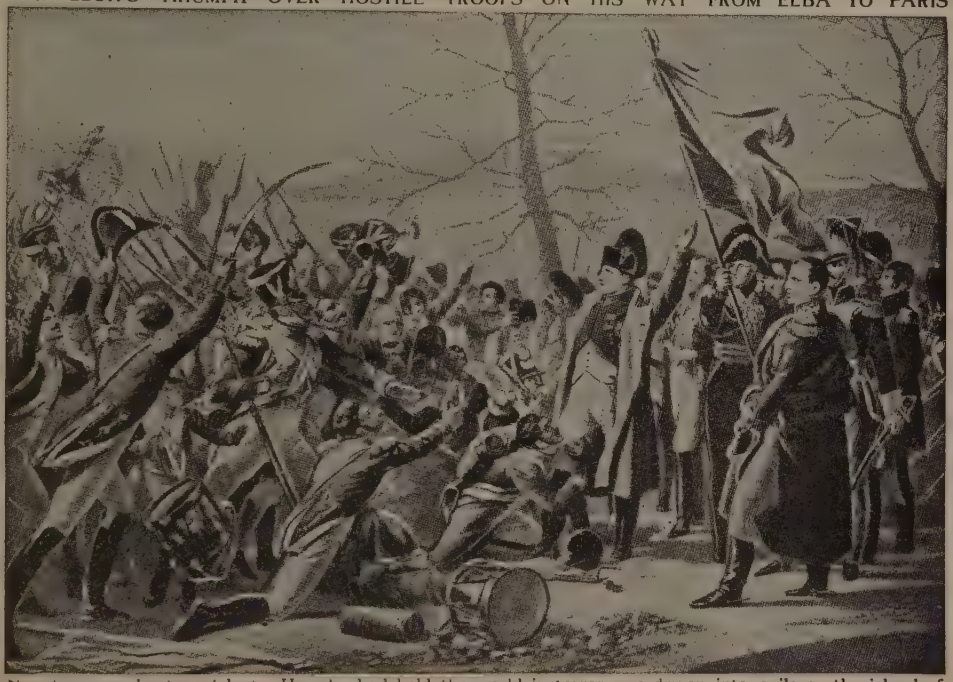
Why had he fallen? They say his brilliant mind had become clouded. In the days of his victory he had been lean and quick, a little slim, fleshless man with flashing eyes, who rapped out words like shots from a gun. This was before he called himself Emperor. Now he was heavy, corpulent, slow of movement, slow of speech. The mind was failing. The great brain was giving way.

But at Elba that great brain flickered up once more like a spluttering candle, and the lurid glare of that dying flicker dazzled the world like a flash of lightning. It will sound to you like a fabulous story. You will think that no

such man ever lived. You will forget that you are reading of one who died only some eighty years ago.

This is the story. While Napoleon lived on the distant island of Elba, he heard that France was unhappy under its new King. He, who had been turned away and stoned out of France, no sooner heard this than he determined to return. His brain conceived the idea of winning back every fragment of his lost glory. Once again the eyes flashed, the words came quickly, the whole man quivered and thrilled with energy. This

NAPOLEON'S TRIUMPH OVER HOSTILE TROOPS ON HIS WAY FROM ELBA TO PARIS



Napoleon was beaten at last. He who had held the world in terror was driven into exile on the island of Elba. But his brain flickered up once more, and he marched to Paris. At Grenoble he was stopped by a regiment of his old troops, pointing their guns against him. He walked up to them alone, and asked, "Where is the man who would shoot his Emperor?" The men dropped their guns and went with him to Paris. For 100 days he ruled again, and then, after his defeat at Waterloo, France threw him off for ever.

despised and beaten exile would go back, and be Emperor once more. He would conquer France. He would defy the world.

So, while all the nations thought that this mighty hero was brooding like a wounded eagle on the rocks of Elba, he and his few soldiers were stepping on board ship at night, and sailing in the direction of France. It seemed the adventure of a madman. The sea was crowded by the French King's ships and by the English ships—and all the world was against Napoleon. One of these French ships came close, and, seeing that the vessel was from Elba, called out laughingly, "How is the little Emperor?"

"Marvellously well!" was Napoleon's answer, who had made all his soldiers hide.

Presently there came a calm, and the few scattered ships of the returning Emperor lay like logs upon the water. A single cannon-shot would have finished the adventure. Napoleon did not lose heart. He composed impassioned addresses to his old army in France, and every soldier on board who could write set about copying these patriotic appeals of the Emperor.

"I shall take Paris without a shot being fired," he cried gaily, and everyone felt the magic of his dauntless soul.

Here was a man whom only death could crush. He trusted to those words copied by the soldiers on shipboard to bring France to his feet. And while he was dictating the words he was surrounded by ships of war.

At last a favourable wind came, and his little fleet arrived at their destination. Napoleon stepped upon French soil. The wounded eagle had returned. Not one of the big warships at sea guessed who had passed them in the tiny fleet.

NAPOLEON'S WONDROUS MARCH THROUGH THE MOUNTAINS OF FRANCE

Then began the wondrous march. With his handful of soldiers, on a bright moonlight night he set out for the long journey to Paris, a journey that ran near to the very towns which had hurled their stones at him but a few months ago, a journey through a mountainous country held by the soldiers of the new King, a journey which a body of police might easily have stopped, and a magistrate have ended by hanging Napoleon.

Was it not wonderful confidence and courage that held this beaten man upon his march? For he trusted to no weapons. He trusted to the magic of his name. He trusted to the fame and power of his soul.

Well, he set out with his soldiers, sending his proclamations before him, which called upon all those who loved France to rally to their Emperor. Soon he was joined by peasants who adored his name. It was like a visit from the tomb. People thronged to him, amazed at the sight they saw. Napoleon's poor soldiers, few of whom had horses, carried their saddles on their shoulders and their arms in their hands, and tramped thus burdened through the mountains, saying nothing but "Long live the Emperor!" As they approached the town of Gap, Napoleon spurred forward with only a few men, and boldly entered the city. He claimed the love of the people. Men and women flocked to him, kissed his hand, and vowed to die for him.

NAPOLEON WALKED TOWARDS SIX THOUSAND LOADED RIFLES, ALONE

He might have been a victorious conqueror instead of a poor exile hated by mankind. Here he rejoiced with the people a few hours, printed his proclamations, and hurried on again. The whole city appeared to follow in his train.

Then they came to the greater city of Grenoble. The general in command of the King's troops, with 6,000 armed men, issued from the city to oppose Napoleon. All the peasants, who had heard of Napoleon's coming, crowded to see the sight.

And slowly through the dust of the mountains came Napoleon and his gallant handful. When he saw the 6,000 soldiers drawn up to dispute his path, he halted his people and went on with a few horsemen. A hundred paces from the line of bayonets, he dismounted and advanced alone.

The order rang out for the troops to fire. Every musket was at the shoulder. Not a bullet came.

Napoleon strode on, without a sign of fear, and, throwing open his cloak, asked, "Where is the man who would shoot his Emperor?" Then the muskets were lowered, and a great shout of "Emperor! Emperor!" went to the sky. He had conquered.

After that, we are told, the march of the exile was like "the spread of a mighty influence which nothing can resist." Regiment after regiment hastened to meet him, the lilies of the new King were torn down and trampled in the dust, and Napoleon's eagle was everywhere set up. City after city came out to meet him.

THE MAGIC NAME THAT BROUGHT THE NATION TO HIS FEET

"Your riding-whip will scatter all resistance," they told him. And sure enough, without a shot being fired, with his enemies and the new King and the new princes fleeing before him, this poor exile arrived in Paris, his eagle, as he said, having flown from steeple to steeple with the national flag, and lighted on the towers of Notre Dame, the great cathedral of Paris. The magic of his name had brought a whole nation to his feet. France had but one language: "Napoleon!"

So he returned. But this flash of genius was the last flicker of his mind, and in a hundred days he was once more trampled in the dust. But that bloodless march from Elba will live in history as one of the most marvellous triumphs of men in all the history of the world. One can almost see the war-scarred veterans kneeling in the dust at the feet of their returning Emperor, almost hear their sobs as they ask for his forgiveness.

THE RAID OF THE WITCHES

THE old witches who hide in lonely caves among the Grampian mountains in Scotland do not now disturb the people there as much as they used to. And Aleck Stewart knows why, though he does not care to tell everybody. Aleck is a young herdsman, and he is as sprightly and daring a lad as you will find in the Highlands. One cloudy summer night he was coming home across the mountains from a wedding feast, and he passed by a cave and heard the sound of voices.

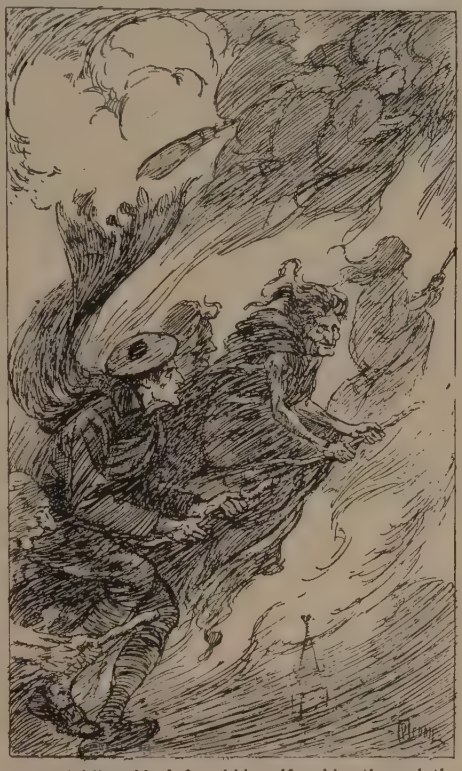
"What can anyone be doing here this time of night?" said Aleck to himself.

There was a tree growing by the cave, and Aleck hid behind it and listened. Suddenly a swarm of witches came out with broomsticks in their hands, and said:

"By yarrow and yew
And my broomstick too,
Leap over to Lapland!"

And away they went on their broomsticks up the clouds. As the last old witch came out, Aleck thought to himself:

"I'll be in this and chance what falls."



In a twinkling Aleck found himself rushing through the air with the witches, riding broomsticks into the clouds.

And he snatched the broomstick from the witch, and got astride of it, and said:

"By yarrow and yew,
And my broomstick too,
Leap over to Lapland!"

In the twinkling of an eye he found himself rushing through the air with the witches, and one of them said:

"However did ye get up here, Aleck?"

But Aleck knew something about witchcraft. He knew that if he uttered a word he would fall off his broomstick and break his neck. So he rode on in silence among the witches. They swiftly passed out of Scotland, and crossed the sea, and arrived at Norway. Then they swept northward and came to Lapland, and flew through the gate of a castle.

"Hey!" cried the man at the gate as the witches swirled by him unseen. "Hey! There's a wild wind blowing in to-night."

The swarm of witches then rushed down the corridors of the castle full against the closed door of a cellar. Aleck shut his eyes, expecting to be hurled against the cellar door. But somehow he whiffled through the keyhole, and when he recovered himself, there he was, sitting in the cellar with the witches, and drinking the wine as gaily as if it had been honestly come by.

"Now ye ken, Aleck," said the witches, "why we never trouble anybody in the Grampians when we need anything. There's always stuff as guid, ay, and better to be gat frae foreigners."

Aleck laughed so loudly that a servant opened the cellar door to see who was within.

"By yarrow and yew,
And my broomstick too,
Skip over to Scotland!"

said the witches; and so said Aleck, getting on his broomstick. And he remembered no more till he found himself waking up outside the cave in the Grampians, just as the summer dawn was breaking. He looked into the cave. There was nobody there. At least, he could not see anybody.

THE UNHAPPY KING OF PERSIA

THERE was once a King of Persia who was very unhappy. He was a great conqueror, and he was very rich and famous; but he had no children, and this made him sorrowful. He built himself a glorious palace on a lonely island in the sea, and lived there.

But one day a merchant came to the palace and brought the King a very beautiful slave-woman. As soon as the King saw the slave-woman he fell in love with her, and married her in great joy. He arrayed her in costly dresses, and he gave her the best rooms in the palace, with all the windows overlooking the sea, and he appointed a hundred attendants to wait upon her. But, strange to say, the slave-woman never spoke to him. She never spoke to anyone. Day after day she sat by a window and gazed at the sea.

In this manner a year passed by, and then a charming little son was born to the King and Queen. The King went wild with delight when he knew that a son and heir had been born, and he threw himself at the feet of the slave-woman and said to her:

"Oh, my beloved Queen, why do you never speak to me? Nothing is wanting to complete my happiness except a single word from your lips."

The slave-woman smiled, and then at last she spoke.

"Ah, my King," she said, "how kindly and tenderly you have treated me since I was dragged as a slave to your palace! But think how a royal princess must feel when she has been sold as a slave!"

"What, you are a princess?" cried the King.

"I am the Rose of the Sea," said the Queen proudly, "and my brother, King Selah, rules over the richest kingdom in the depths of the ocean. Unhappily, we have quarrelled. Last year our country was invaded and our palace destroyed, and, fearing that I might fall into the hands of the enemy, Selah wanted to wed me to some prince of the earth.

"This vexed me, and I sprang from the bottom of the sea and landed on the shore of your island. There I was found by a merchant, and he at once brought me to you and sold me as a slave."

"But I have not treated you as a slave, dearest," said the King.

"No," said Rose of the Sea, very gently; "and because you have made me your Queen and loved me very dearly, I have not cast myself into the sea and gone back to my brother, as I intended to do. Now that I have a son, I must call Selah up to see him."

Rose of the sea bade an attendant bring in a brazier of burning coal, and then she took a piece of aloe from a little box and threw it on the fire. As the smoke rose up and drifted out of the window, she said some words in a strange tongue.

The sea began to heave up, and the waves parted, and out of the waves rose a tall and handsome young man in splendid garments, and with a crown on his head. He was surrounded by a company of brilliant ladies and courtiers. The King of the Sea and his people came to the island and entered the palace.

"Ah, my dear Rose of the Sea," he said, as he saw his sister, "I have conquered all our enemies, and you can now return and marry some prince of the sea!"

"I am already married, my dear Selah," said Queen Rose of the Sea. "This is my husband, the King of Persia, and this is our little boy."

Selah took the baby in his arms, and then, to the horror of the King of Persia, he sprang out of the window and leapt down into the sea with it.

"Don't be afraid," said Queen Rose of the Sea. "Selah has only done what I meant to do. He wishes to see whether our baby can live under the water, as all the people of the sea can do."

So it was. In a few minutes Selah returned, bearing in his arms the little Prince, who was crowing with joy. He had breathed the salt water as easily as he breathed the air, and not a bit of his clothing was wet.

"What a day of wonders this is!" said the King of Persia. "If I had not seen it all with my own eyes, I should never have believed it."

He was at first much disappointed to find that he could not spring down to the bottom of the ocean and visit the marvellous kingdoms lying beneath the sea; but his son and his wife told him wonderful stories of the strange things that went on beneath the ocean.

A KING AND HIS COURT ROSE OUT OF THE SEA

Out of the waves rose a tall and handsome young man in splendid garments, and with a crown on his head. He was surrounded by a company of brilliant ladies and courtiers. The King of the Sea and his people came to the island and entered the palace. "Ah, my dear Rose of the Sea," he said, as he saw his sister, "I have conquered all our enemies, and you can now return and marry some prince of the sea!"

CINDERELLA AND THE GLASS SLIPPER

In the days of the fairies there was a little girl named Cinderella. She had no mother, but she lived in a great house with her father, and was the happiest little girl in the world.

One day a strange lady came to the house with her two daughters; they were so finely dressed and so proud-looking that Cinderella felt very shy. But when her father told her that the strange lady was her new mother—her stepmother—and that the proud-looking young ladies were her new sisters, Cinderella was very glad, because she thought that they would be kind to her.

But the new sisters were not kind at all. They took her toys away, and gave her all the hard work to do. She had to wash up the cups and saucers and sweep the floors. Sometimes, when she had done her work and was very tired and lonely, she would sit and watch the fire-fairies play among the cinders; and that is why they called her Cinderella.

One day Cinderella heard that the King was to give a very grand ball. The Prince was to be there, and all the great people were to dance with him. The proud sisters were going; but nobody thought of taking little Cinderella.

And Cinderella was very sad.

"I should like to go," she sobbed, when she saw her sisters' lovely dresses. "Oh, I should like to go to the ball!"

But when the carriage came and took the sisters to the palace, poor little Cinderella was left all alone. She sat down on her little stool and cried till the big tears splashed down on her little brown frock, and Cinderella said to herself again and again:

"I do want to go—I do want to go to the ball."

Then suddenly came a voice.

"And you shall go," said somebody.

Cinderella looked up, and there, standing at her side, was a fairy.

"I am your fairy godmother," she said. "Now, if you do just as I tell you, and ask no questions, you shall see what I can do."

She kissed Cinderella and wiped away her tears.

"First of all, you must fetch me a pumpkin," she said.

Cinderella ran into the garden, and brought the largest pumpkin she could find. The fairy godmother bent down and touched it with her wand, and suddenly, as quick as lightning, the pumpkin was turned into the grandest coach Cinderella had ever seen, with blue velvet seats and silver doors.

"Now I want a mouse-trap," said her godmother.

Away ran Cinderella, and when she brought the mouse-trap, with six mice in it, the fairy touched that, too. Suddenly, in a minute, the six wee little mice that were squeaking inside were changed into six lovely white horses.

"And now," said the fairy, "bring me the rat-trap and two lizards."

Cinderella brought them, and the fairy turned them into a coachman and two great footmen.

Cinderella clapped her hands for joy, and did not know what to do because she was so happy.

"Shut your eyes!" cried the fairy.

Cinderella shut her eyes tight, and when she opened them again she found that she had on a beautiful frock, grander than any she had ever seen, and on her feet were two little glass slippers. The fairy opened the coach door.

"Jump in," she cried, "and drive away to the ball! But remember one thing. Remember that *you must be home before the clock strikes twelve.* Promise me that you will obey me. Promise that you will do exactly as I say."

Cinderella promised, and drove off to the ball. When she got to the palace, who should come to meet her but the Prince himself. His coat was of blue satin, and at his side hung a beautiful sword with sparkling handle. He took Cinderella's hand and led her into the ball-room. Everybody left off dancing to look at the Prince and the beautiful maiden whose name nobody could guess.

Cinderella enjoyed dancing with the Prince so much that she forgot all about the time, and about her fairy godmother, until she caught sight of the clock. It was just going to strike twelve, and Cinderella became so frightened that she jumped up quickly and ran out of the ball-room as fast as she could go—so fast that one of her slippers came off.

CINDERELLA SAT AND WATCHED THE FIRE-FAIRIES PLAY AMONG THE CINDERS

The fairy is seen here touching the pumpkin with her wand and bringing out the wonderful coach. Cinderella is running downstairs as the clock strikes, losing her slipper, and the last picture shows her a kitchen-maid again, fitting on the slipper brought by the Prince's messenger, who leads her to the palace, where the Prince makes her his bride.

But she could not wait to pick it up. On she ran, through the ball-room and down the stairs, past the tall footmen, and as she reached the door the clock struck twelve.

Cinderella trembled and ran out into the street, but, alas! the coach and horses had vanished. She looked at herself and found that her pretty dress had vanished too, and the little brown frock was there instead.

Poor little heart-broken Cinderella cried all the way home, and when the sisters came back from the ball they found her sobbing among the cinders.

The next day the King's messenger went round the city blowing a silver trumpet, and all the people came out to listen. He said the Prince had found a glass slipper which belonged to a beautiful lady he had danced with at the ball. No one knew who she was, but she was so gentle and sweet that the Prince had fallen in love with her, and he said that if only they could find her he would marry the lady who could wear the glass slipper.

All the ladies of the land came to try on this wonderful glass slipper, but it was so tiny that none of them could wear it. At last the messenger came to the house where Cinderella lived. The stepsisters became so excited, and were so anxious to try on the slipper, that they could hardly wait to unfasten their shoes, and had to call Cinderella to help them. But when Cinderella saw the slipper she knew it at once. It was *her* shoe, which had slipped off at the ball when the clock struck twelve.

The two sisters tried and tried, but the shoe would *not* go on.

"Please *do* let me try it on," said Cinderella.

"You, indeed!" cried the sisters, pushing her away. "As if a kitchen-maid could wear such a shoe!"

But the messenger put out his hand and helped Cinderella into the chair. She took off her old shoe and put out her foot, and in a minute the wonderful slipper was on. It fitted perfectly.

Suddenly there was a sound like a rushing wind, and in a moment the fairy godmother was at Cinderella's side, and Cinderella was a grand lady again.

Cinderella stepped into the coach which was waiting for her at the door and drove away with the messenger to the palace, where the Prince met her and made her his bride.

THE LEGEND OF THE WANDERING JEW

The story is told that, as our Lord was carrying the cross up to Calvary, He stayed for a moment to rest by the house of a shoemaker, but the shoemaker drove our Lord away, saying:

"Go on! Go on! You shall not rest here."

And our Lord took up the cross, and said, "I am going to my rest, and you must wander until I return."

So the shoemaker was turned into the Wandering Jew, who will never find rest until our Lord comes again on earth at the Day of Judgment. The mark of a red cross appeared on his forehead, and he left his wife and children, and followed our Lord to Calvary, and then he turned away from Jerusalem, and began his long, strange pilgrimage.

On and on he went, a barefooted, tall old man, with his hair hanging about his shoulders, and a black bandage round his forehead to conceal the mark of the red cross there.

And on and on he still goes at the same striding pace, over mountains and across deserts, and down all the long, white roads of the world. But a little rest is sometimes allowed to him. If he happens to be passing by a Christian church on Sunday morning, just as the service is beginning, he can enter and stand there and listen to the sermon.

In 1505 a weaver in Bohemia, whose name was Kokot, was trying to discover some treasure which his grandfather had hidden in the Royal palace. And as he was vainly digging here and there the Wandering Jew passed by.

"Your grandfather was burying the treasure the last time I came by here," said the Wandering Jew, "and, if I remember rightly, he was burying it beneath that wall there."

Kokot at once dug beneath the wall, and there he found the treasure. But before he could thank the Wandering Jew the strange pilgrim had passed out of sight.

The next Stories are on page 867

THE PLEASURES OF MEMORY

THE memory ought to be a storehouse, not a lumber-room, says an old writer; and there is nothing we can store away in this magic chamber of our mind more worth having than the riches of the poets, which will outlast other possessions. "The pleasures of memory" have been sung by more than one of our poets, and though, of course, poetry is by no means the only one of these pleasures, it is one of the greatest. Here we are to see how it may best be stored in our memory.

HOW TO REMEMBER POETRY

CONTINUED FROM PAGE 705

A LITTLE girl was once asked what her memory was, and she said, "It is the thing I forget with." To how many of us, both old and young, is the memory the thing we forget with! Yet it is quite an easy matter to make it the thing we remember with. All our faculties can be made better by use. If we do not practise walking regularly, we shall in time become very poor walkers. That is so apparent that any boy or girl does not need to be told it. If we do not practise remembering, we shall in time find our memory is of little use to us. That is perhaps not so clear to everyone, and people, but especially young people, need to be told this.

It is with our brain that we remember; our "memory" is one of the departments of the brain's work. One might think that memory could do only a certain amount of work; that it could remember just a certain number of things; that a time would come when, so to say, the storehouse of Memory was full. But that is not so. There is no limit to what our brain, if properly set to work, will enable us to remember. In olden times, before printing was invented, whole books, such as Homer's "Iliad," described on page 67, were carried for years in the memory of people. Most of our legends existed for ages in the memories of common people only, and were not written down in some cases until hundreds of years had passed away. Now, of all written words, none are easier to carry in our minds than poetry, and we should make a habit of "learning by heart" as many poems as possible; not merely for the sake of remembering them, but to exercise our minds, just as we go for walks to exercise our legs.

There are many "systems" of remembering, but if we begin young to remember what we have read we do not need systems; our minds, when young and fresh, form systems for themselves without any effort on our part. But there are a few simple rules that can help us.

We must read with close *attention* to what the writer has to say, be it in prose or poetry. Secondly, we should read once in order to get a general idea of the author's story. For instance, to remember. "Lord Ullin's Daughter," we read it first in order to get the story, noting how one thing follows on another: The flight of the lovers, the pursuit by the angry father, storm on the lake, the boat overwhelmed by the waves, and the father's lament for his daughter. By noting these points we remember easily how the story proceeds.

We next read more closely still, noting the chief points of each verse, thus: (1) boatman and ferry; (2) Highland chief and Lord Ullin's daughter; (4) horsemen, bonnie bride, and so forth. Finally, we have the actual words to remember, and this we do, first, by noting the rhythm (see page 699) and the rhyme (see page 93); secondly, by emphasising in our minds the "picture words" as we call the particular words in each verse that raise up a picture before our minds. In the second verse of this poem the picture words are "stormy water;" in the third, "glen" and "heather." These words suggest "pictures" to us at once, and help us to recall the verse more easily. Of course, we must read the poem many times before we have it "by heart," and it should be read aloud as often as possible.

THE BEGGAR MAID

The legend of King Cophetua and the Beggar Maid is very old, and is mentioned by Shak espeare in several of his plays. Tennyson tells it perfectly in the space of sixteen lines.

HER arms across her breast she laid;
She was more fair than words can say:
Bare-footed came the beggar maid
Before the king Cophetua.
In robe and crown the king stept down,
To meet and greet her on her way;
"It is no wonder," said the lords,
"She is more beautiful than day."

As shines the moon in clouded skies,
She in her poor attire was seen;
One praised her ankles, one her eyes,
One her dark hair and lonesome mien.
So sweet a face, such angel grace,
In all that land had never been.
Cophetua sware a royal oath:
"This beggar maid shall be my queen!"

LULLABY OF AN INFANT CHIEF

This tiny poem, by the great Sir Walter Scott, takes us back to the days of old warfare, the days of old romance, about which Sir Walter loved to write in his great books.

OH, hush thee, my baby! thy sire was a knight,
Thy mother a lady, both lovely and bright;
The woods and the glens, from the towers which we see,
They all are belonging, dear baby, to thee.

Oh, fear not the bugle, though loudly it blows!
It calls but the warders that guard thy repose;
Their bows would be bended, their blades would be red,
Ere the step of a foeman draws near to thy bed.

Oh, hush thee, my baby! the time will soon come
When thy sleep shall be broken by trumpet and drum;
Then hush thee, my darling! take rest while you may,
For strife comes with manhood, and waking with day.

MY MOTHER

This children's poem has long been a favourite, expressing what each of us must feel about our mother's love. It was written by Jane Taylor, who wrote "The Star," on p. 1124.

WHO fed me from her gentle breast,
And hush'd me in her arms to rest,
And on my cheeks sweet kisses prest?
My Mother.

When sleep forsook my open eye,
Who was it sang sweet hushaby
And rock'd me that I should not cry?
My Mother.

Who sat and watched my infant head
When sleeping on my cradle bed,
And tears of sweet affection shed?
My Mother.

When pain and sickness made me cry,
Who gaz'd upon my heavy eye,
And wept, for fear that I should die?
My Mother.

Who drest my doll in clothes so gay,
And taught me *pretty* how to play,
And minded all I had to say?
My Mother.

Who ran to help me when I fell,
And would some pretty story tell,
Or kiss the place to make it well?
My Mother.

Who taught my infant lips to pray,
And love God's holy book and day,
And walk in wisdom's pleasant way?
My Mother.

And can I ever cease to be
Affectionate and kind to thee,
Who wast so very kind to me,
My Mother.

Ah! no, the thought I cannot bear,
And if God please my life to spare,
I hope I shall reward thy care,
My Mother.

When thou art feeble, old, and grey,
My healthy arm shall be thy stay,
And I will soothe thy pains away,
My Mother.

And when I see thee hang thy head,
'Twill be my turn to watch thy bed,
And tears of sweet affection shed,
My Mother.

WEE WILLIE WINKIE

This famous Scotch nursery song was written by a Glasgow working man, named William Miller, who died in 1872. "Willie Winkie" is known to some children as "The Dustman," who comes to make the children sleepy.

WEE Willie Winkie rins through the town,
Upstairs and downstairs in his nicht-gown;
Tirling at the window, crying at the lock,
"Are the weans in their bed, for it's now ten o'clock?"

Hey, Willie Winkie, are ye coming ben?
The cat's singing grey thrums, to the sleeping hen;
The dog's spelder'd on the floor, and doesna' gie a cheep,
But here's a waukrife laddie that winna' fa' asleep.

Onything but sleep, you rogue! Glow'ring like the moon,
Rattling in an airn jug wi' an airn spoon;
Rumblin', tumblin', round about, crawing like a cock,
Skirlin' like a kenna—what, wauk'nin' sleeping folk.

Hey, Willie Winkie, the wean's in a creel!
Wamblin's aff a body's knee like a very eel,
Ruggin' at the cat's lug, rav'llin' a' her thrums—
Hey, Willie Winkie—see, there he comes!

Wearied is the mither that has a stoorie wean,
A wee stumpie stousie, that canna rin his lane,
That has a battle aye wi' sleep, before he'll close an e'e—
But a kiss frae aff his rosy lips gies strength anew to me.

KING COPHETUA AND THE BEGGAR MAID

COPHETUA SWARE A ROYAL OATH, "THIS BEGGAR MAID SHALL BE MY QUEEN."

BANNOCKBURN

Every country has its national songs, in which the heroic spirit of its people is expressed and its great deeds remembered. Scotland is rich in these songs, and perhaps the most famous celebrates the heroism of the Scots at the battle of Bannockburn, where they defeated the English. It was written by Robert Burns, the greatest Scottish poet.

Scots, wha hae wi' Wallace bled—
Scots, wham Bruce has often led—
Welcome to your gory bed,
Or to victorie!

Now's the day, and now's the hour:
See the front o' battle lower;
See approach proud Edward's power—
Chains and slaverie!

Wha will be a traitor knave?
Wha can fill a coward's grave?
Wha sae base as be a slave?
Let him turn and flee!

Wha for Scotland's king and law
Freedom's sword will strongly draw,
Freeman stand or freeman fa'—
Let him on wi' me!

By oppression's woes and pains!
By your sons in servile chains!
We will drain our dearest veins,
But they shall be free!

Lay the proud usurpers low!
Tyrants fall in every foe!
Liberty's in every blow!
Let us do, or die!

PICTURES IN THE FIRE

On page 95 we read R. L. Stevenson's fanciful verses about "Armies in the Fire." Here is Adelaide Anne Proctor's poem with the same fancy, but gives us an ever-changing series of the pictures we may see in the fire. It is more sentimental than Stevenson's, and not so simple.

What is it you ask me, darling?
All my stories, child, you know;
I have no strange dreams to tell you,
Pictures I have none to show.

Tell you glorious scenes of travel?
Nay, my child, that cannot be;
I have seen no foreign countries,
Marvels none on land or sea.

Yet strange sights in truth I witness,
And I gaze until I tire;
Wondrous pictures, changing ever,
As I look into the fire.

There, last night, I saw a cavern,
Black as pitch; within it lay
Coiled in many folds a dragon,
Glaring as if turned at bay.

And a knight in dismal armour
On a wingéd eagle came,
To do battle with this dragon;
And his crest was all of flame.

As I gázed the dragon faded,
And, instead, sat Pluto crowned,
By a lake of burning fire;
Spirits dark were crouching round.

That was gone, and lo! before me,
A cathedral vast and grim;
I could almost hear the organ
Peal along the arches dim.

As I watched the wreathéd pillars,
Groves of stately palms arose,
And a group of swarthy Indians
Stealing on some sleepy foes.

Stay; a cataract glancing brightly,
Dashed and sparkled; and beside
Lay a broken marble monster,
Mouth and eyes were staring wide.

Then I saw a maiden wreathing
Starry flowers in garden sweet;
Did she see the fiery serpent
That was wrapped about her feet?

That fell crashing all and vanished;
And I saw two armies close—
I could almost hear the clarions,
And the shouting of the foes.

They were gone, and lo! bright angels,
On a barren mountain wild,
Raised appealing arms to Heaven,
Bearing up a little child.

And I gazed, and gazed, and slowly
Gathered in my eyes sad tears,
And the fiery pictures bore me
Back through distant dreams of years.

Once again I tasted sorrow,
With past joy was once more gay,
Till the shade had gathered round me—
And the fire had died away.

WHAT EVERYONE KNOWS

Cocks crow in the morn
To tell us to rise,
And he who lies late
Will never be wise;
For early to bed,
And early to rise,
Is the way to be healthy
And wealthy, and wise.

THE WORLD

William Brighty Rands, the author of this poem, wrote much charming verse of a light, humorous kind. In "The World" there is a touch of humour, but it has the common-sense which asks us to remember that, though we may be insignificant in size compared with Nature, we have the power to triumph over Nature. We have brain—but we must use it.

Great, wide, beautiful, wonderful world,
With the wonderful water round you curled,
And the wonderful grass upon your breast—
World, you are beautifully drest.

The wonderful air is over me,
And the wonderful wind is shaking the tree,
It walks on the water and whirls the mills,
And talks to itself on the tops of the hills.

You friendly Earth! how far you go,
With the wheat-fields that nod and the rivers that flow,
With cities and gardens, and cliffs and isles,
And people upon you for thousands of miles!

Ah! you are so great, and I am so small,
I tremble to think of you, World, at all;
And yet when I said my prayers to-day,
A whisper inside me seemed to say:
"You are more than the Earth, though you are such a dot;
You can love and think, and the Earth cannot!"

"OH, I'M THE CHIEF OF ULVA'S ISLE, AND THIS, LORD ULLIN'S DAUGHTER!"

LORD ULLIN'S DAUGHTER

This is one of the most famous of Thomas Campbell's poems, in which an old Highland story is told in the simple, straightforward style of the ballad. A ballad is usually a romantic story in verse, but it may be humorous. This one is tragic in the highest sense, and gives a stirring picture of a Scottish loch, or lake, during a great storm. In olden days people thought evil spirits lived in the lakes, and the scream of the storm was the evil spirit, or "water-wraith," mentioned in the seventh verse, delighting in its work.

A CHIEFTAIN to the Highlands bound
Cries: "Boatman, do not tarry!
And I'll give thee a silver pound
To row us o'er the ferry!"

"Now who be ye, would cross Lochgyle,
This dark and stormy water?"
"Oh, I'm the chief of Ulva's isle,
And this, Lord Ullin's daughter!

"And fast before her father's men
Three days we've fled together,
For should he find us in the glen
My blood would stain the heather.

"His horsemen hard behind us ride—
Should they our steps discover,
Then who will cheer my bonnie bride
When they have slain her lover?"

Out spoke the hardy Highland wight,
"I'll go, my chief, I'm ready!
It is not for your silver bright,
But for your winsome lady:

"And, by my word, the bonny bird
In danger shall not tarry;
So though the waves are raging white,
I'll row you o'er the ferry."

By this the storm grew loud apace,
The water-wraith was shrieking;
And in the scowl of heaven each face
Grew dark as they were speaking.

But still as wilder blew the wind,
And as the night grew drearer,
Adown the glen rode arméd men,
Their trampling sounded nearer.

"Oh, haste thee, haste!" the lady cries,
"Though tempests round us gather;
I'll meet the raging of the skies,
But not an angry father."

The boat has left a stormy land,
A stormy sea before her—
When, oh, too strong for human hand
The tempest gathered o'er her!

And still they rowed amidst the roar
Of waters fast prevailing;
Lord Ullin reached that fatal shore—
His wrath was changed to wailing:

For, sore dismayed, through storm and shade
His child he did discover;
One lovely hand she stretched for aid,
And one was round her lover.

"Come back! come back!" he cried in grief,
"Across this stormy water;
And I'll forgive your Highland chief—
My daughter—O my daughter!"

'Twas vain: the loud waves lashed the shore,
Return or aid preventing:
The waters wild went o'er his child,
And he was left lamenting.

LITTLE VERSES FOR VERY LITTLE PEOPLE

Hi! diddle diddle,
The cat and the fiddle,
The cow jumped over the moon;
The little dog laughed
To see such sport,
While the dish ran after the spoon.

Sing, sing, what shall I sing?
The cat has eaten the pudding-string!
Do, do, what shall I do?
The cat has bitten it quite in two.

Who comes here?
A grenadier.
What do you want?
A pot of beer.
Where is your money?
I have none.
Then, grenadier,
Get you gone.

Thirty days hath September,
April, June, and November;
February has twenty-eight alone.
All the rest have thirty-one;
Excepting leap-year, that's the time
When February's days are twenty-nine.

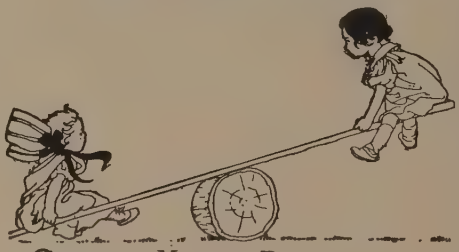
Little Tom Tucker
Sings for his supper;
What shall he eat?
White bread and butter.
How shall he cut it
Without a knife?
How can he marry
Without a wife?

Young lambs to sell!
Young lambs to sell!
If I'd as much money as I could tell,
I never would cry—Young lambs to sell!

Little Nanny Etticoat,
In a white petticoat,
And a red nose;
The longer she stands
The shorter she grows.

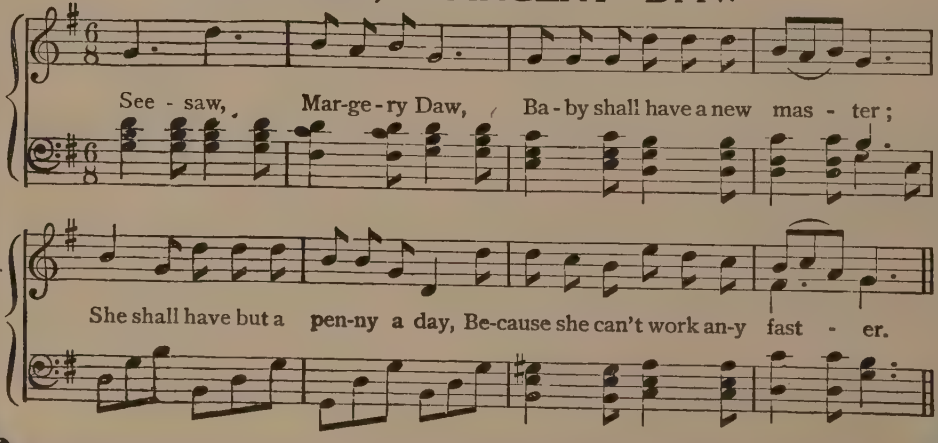
Peter Piper picked a peck of pickled pepper;
A peck of pickled pepper Peter Piper picked;
If Peter Piper picked a peck of pickled pepper,
Where's the peck of pickled pepper Peter Piper picked?

Bye, Baby Bunting,
Daddy's gone a-hunting
To get a little rabbit-skin
To wrap a Baby Bunting in.



See-saw, Margery Daw,
Baby shall have a new master;
She shall have but a penny a day,
Because she can't work any faster.

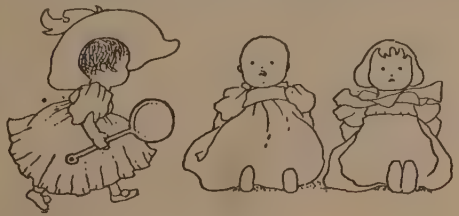
SEE-SAW, MARGERY DAW



To market,
to market,
to buy a fat pig,
Home again, home
again, Jiggety Jig.
To market, to market, to
buy a fat hog,
Home again, home again,
Jiggety Jog.

There were
two
black-
birds,
Sitting on
a hill,
The one
named
Jack,
The other named Jill;
Fly away, Jack! Fly away, Jill!
Come again, Jack! Come again, Jill!

Robin and Richard were two pretty men;
They lay in bed till the clock struck ten;
Then up starts Robin and looks at the sky,
Oh, brother Richard, the sun's very high!
You go on with bottle and bag,
And I'll follow after on jolly Jack Nag.



Come, let's to bed,
Says Sleepy-head,
Tarry a while, says Slow,
Put on the pan, says Greedy Nan,
Let's sup before we go.

There was an
old woman
Lived under
a hill;
And if she's not
gone,
She lives
there still.

Little Jack Horner sat in a corner
Eating a Christmas pie;
He put in his thumb, and he took out a plum,
And said, "What a good boy am I!"

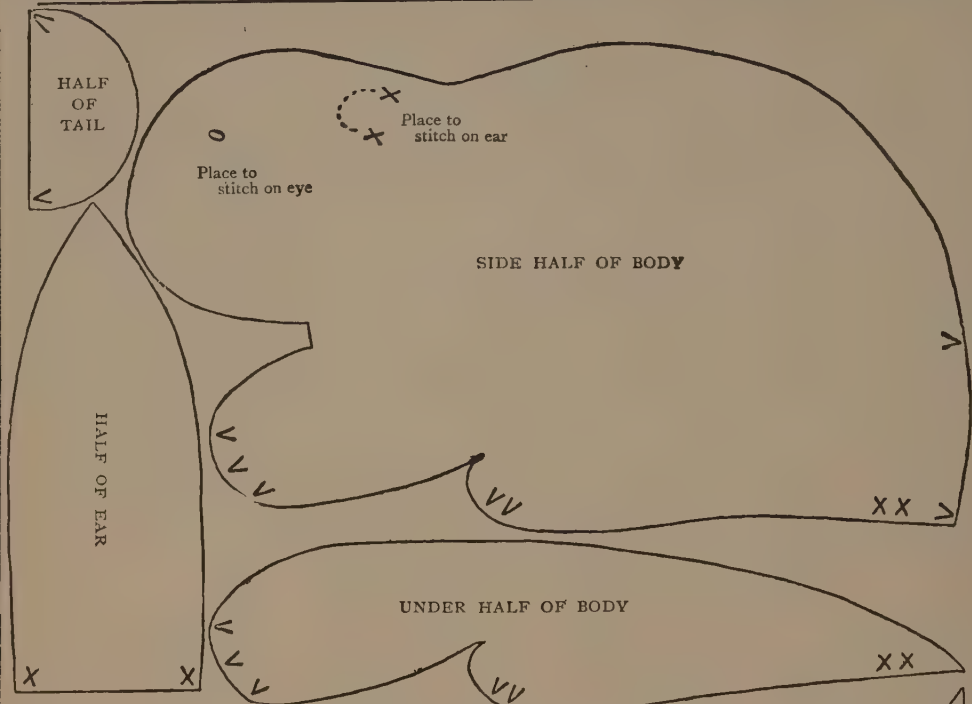
This little pig went to market.
This little pig stayed
at home,
This little pig got roast
beef,
This little pig got none;
This little pig cried
"Wee, wee!"
all the way home.

Four and twenty tailors went to kill a snail,
The best man amongst them durst not touch her tail;
She put out her horns like a little Kyloe cow,
Run, tailors, run, or she'll kill you all e'en now.

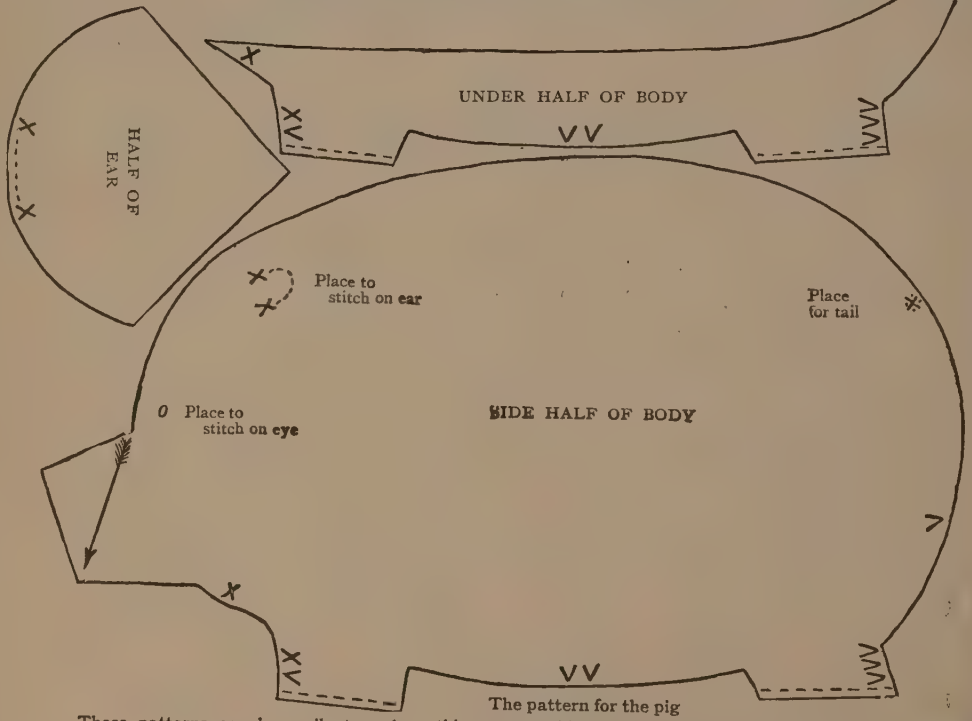
Here am I, little
Jumping Joan,
When nobody's with
me
I'm always alone.

Matthew, Mark, Luke and John,
Guard the bed that I lie on!
Four corners to my bed,
Four angels round my head—
One to watch, one to pray,
And two to bear my soul away.

THE PLANS FOR MAKING A TOY ZOO



The pattern for the rabbit



The pattern for the pig

These patterns can be easily traced on thin paper, which can be then used for cutting out

WHAT THESE PAGES TEACH US

IN these pages are instructions for the making of two more animals for our toy Zoo, which began on page 575. Those of us who have our own little garden also learn what we can do in the garden at the end of May. Those of us who are building Modeltown find here plans and instructions for making a villa. Another conjuring trick for boys, another little doll's garment for girls, also come into this part of our book.

CONTINUED FROM PAGE 724

A RABBIT AND A PIG FOR OUR TOY ZOO

THE rabbit and the pig are both made of swansdown calico ; a quarter of a yard of the best, unbleached, at about 25 cents a yard will be more than enough for the two. Piggie has legs of hat-wire.

The rabbit is so simple to make that anyone who made the cat shown in our first article will scarcely need any explanation of the pattern. Two pieces to face each other must be cut of each part shown except the ears, and of these the under halves are of pink satin or inch-wide satin ribbon. The neatest way to sew on a rabbit's ear is to cut a slit, as shown below, in the stuff on each side of the head after the animal is stitched, and before it is filled. The point should be towards the tail.

The rabbit for our toy Zoo

The two sides of the ear should be folded towards the middle, to make it small at the root, and secured with a stitch or two. Then poke the ear through the slit so that the three-cornered flap made by the cut goes in along with it to the other side. Look inside to see what you are doing, and when about a quarter of an inch of the ear is well through, fasten it down on the wrong side. Then hem it neatly round on the right side also, fasten off so that the ear will fall over the fastening to hide it, fluff out the nap all round where the ear is joined to the head, and it will look almost as if it grew there ! If you are making the ears to stand up, do just the same, only make the point of the slit incline upwards instead of towards the tail. The tail should be sewn up and turned before the back seam of the body is quite finished, so that it can be inserted and sewn in with the seam. It is impossible to make it look neat if sewn on after the rest of the rabbit is finished. Bunny has a pink or fawn-coloured worsted nose, as shewn here, made by big stitches of coloured cotton, and bead eyes. All the seams should have the nap carefully fluffed up, to hide the stitches.

The pig for our toy Zoo

Now we are going to make our pig. Leave the piece where the dots are in the pattern open when all the rest is stitched up for the openings where his legs are to be fixed in. After piggy is stuffed, a stitch or two of double thread sent through in the direction of the arrow in the pattern will wrinkle it up into such a natural expression that you can almost hear him grunt ! The pink-lined ears are turned downwards, towards the face, so the point of the V-shaped slit should be turned in the same direction ; they are folded over and inserted in the same way as those of the rabbit. Piggy's legs will each need a piece of bonnet-wire about three inches long, doubled, and bent as shown here. All except the bent part must be sewn up in a piece of material turned in at the lower end, and turned under—as it would fray otherwise where you sew it up. The loop of wire must be covered with a black glue, called "elastic" or "Prout's" glue, which most stationery shops keep in stock. This becomes soft directly you warm it. Put a dab on the loop of wire, and quickly mould it all round the wire with a *wet* finger and thumb. If you press your thumb-nail into the groove between the double wire, you can imitate piggy's cloven "trotter." The legs are poked up into the body after it is stuffed, until only half an inch, in addition to the foot, can be seen. Turn in the raw edges of the leg-holes which were left, and hem them neatly down on the legs. His eyes are made of two black beads. A bit of white worsted, crocheted up to a piece of chain, can be sewn on to form piggy's tail.

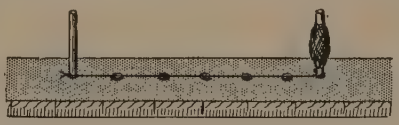
A LITTLE GARDEN MONTH BY MONTH

WHAT TO DO AT THE END OF MAY

This is about the busiest time in the whole year where there are many plants to put out that have had protection through the winter.

We will suppose that our geraniums and fuchsias have by this time become thoroughly hardened by standing out in the open; therefore, they may be taken from their pots now, and planted out for the summer months in the garden plot.

If the geraniums are what are called *ivy-leafed* geraniums (with smooth, glossy leaves) they may be treated in one of two ways—the growths may be pegged down to the soil, or they may be lifted and tied up to stakes — it depends whether we wish to make use of them as tall or as dwarf plants. These ivy-leafed geraniums are also splendid to treat as hanging plants. Wire baskets may be bought, and carefully lined with moss, filled with soil, and the geraniums planted. Long trails of flower-covered growth will by-and-by hang down on all sides.



A good way to get a straight line for plants that are to be planted in rows—get two sticks and stretch some tarred line from one to the other.

It makes a charming addition to the little garden plot if we can procure a couple of small tubs to stand at the entrance. And no plant looks better in them than the pink-flowered hydrangea. Fortunately these flowers continue for months in good condition. In very many parts of the country they need no winter protection. But if we cannot get tubs even fair-sized pots with some pretty flowering plants in them that we may happen to have could be used like this.

If tubs are used they should be raised above the soil by placing three bricks beneath them. If pots are to stand out in this manner, either they should have a small ring of wood beneath them, or a layer of ashes, the object being to prevent worms from entering through the drainage hole at the bottom.

Some pots of pink-flowered hydrangeas will make a charming addition to a little garden plot.

Just at this season there are thousands of small plants to be bought for a penny or nickel or perhaps ten cents each, so that, if we have not sufficient material to fill our plots, a dollar or so expended now will go a long way to help us.

It may happen that we wish to put out certain plants in rows, either flowering plants or vegetables, and here is the gardener's method of making his line straight and keeping it true. Two stout stakes must be procured and they may be pointed at one end. A piece of "tarred line," such as is used for tying up strong plants, is fastened to each. At the end of the row the stake is put down into the ground, and the tarred line, which has been neatly wound around the unsecured stake, is unwound to the required length. This stake is inserted at the other end, the tarred line lying straight along the ground between them and making a guiding line for the required holes the whole distance of the row.

In planting our garden plots we must not altogether overlook the fact that some colours agree better together than others. If there are half a dozen geraniums, and some are red and some are pink, it is better to keep them separate. White flowers can be placed next to anything, and they show off well at a distance. Rose-coloured flowers make a splendid display.

Dahlias must not be planted until all fear of frost is over, and the first week of June will be soon enough except in the south; this applies to all plants that have been brought forward under glass.

Of course, at this season we may feel cramped for space. There is such a number of things we should like to grow if only the plot would hold them. The best way out of the difficulty is to transplant anything that has finished flowering to some nice cool spot, if we can but secure it. For instance, our primrose plants that have been so gay, and their near relatives, the polyanthuses, may be carefully lifted with plenty of soil about the roots, and put somewhere else for the summer. They must be watered into their new quarters, and through the coming months they will need watering from time to time. Until they have become settled they should be shaded from the sun. A cool, showery day should be chosen for taking them up, and they should be replanted at once. It is well to remember that, *whatever* we are planting, the roots should not be allowed to become dry. If there are many plants to be lifted, those first removed should have their roots covered with a piece of damp sacking, or a spadeful of soil should be thrown over them. Never transplant anything in windy weather if it can be avoided; for, after it is in place, until the roots are freely at work again, a plant is terribly susceptible to the drying effects of wind.

Put in your plants firmly, draw up the soil and press it well about them, and in putting in a large plant even tread the soil about it after you have planted it, and never plant when the soil is wet enough to be sticky.

LITTLE PROBLEMS FOR CLEVER PEOPLE

THE problems are continued from page **723**, and the answers below refer to the problems given on that page.

DID HE CATCH THE TRAIN?

45. "The station is twelve miles away," said a cyclist at a hotel, "and I have an hour and a half to catch the train. There are four miles uphill, which I must walk, and can do at four miles an hour; there are four miles downhill, where I can coast at twelve miles an hour; and there are four miles level, which I shall do at eight miles an hour. This is an average of eight miles an hour, and I shall be just in time."

Did he catch the train?

HOW MANY RUGS WERE THERE?

46. "This is awkward," said the carpet manufacturer to his accountant; "there is an entry for a sale, and many of the figures have been obliterated. It reads: ' rugs at £10 os. 2½d. each = £1,··· os. 2½d.'" "Then we can work it out," said his assistant, and he did.

Can you?

WHAT WERE THE TWO SUMS?

47. "I have two invoices," said the merchant, "which together amount to £34. In one the pounds, shillings, and pence are equal. In the other the pounds are twice the shillings and the shillings are twice the pence."

What were the two sums of money?

DID HE LOSE MONEY?

48. "I have just sold two houses," said Thomson, "for $4950 each. On one I lost ten per cent. and on the other I gained ten per cent." "Then you are exactly where you were," replied his friend.

Was he?

HOW FAR DID WILLIAM GO?

49. John met his friend William starting out from his house at 5 o'clock. "How far are you going?" said John. "Perhaps you can guess," replied William. "If I walk at the rate of four miles an hour I shall be there five minutes late, but if I walk at five miles an hour I shall be there ten minutes too soon."

How far was he going?

DID HE CATCH THE TRAIN?

50. A train started from a station 11 minutes late, and went at 10 miles an hour to the next station, which is 1½ miles away, and where it stops 14½ minutes. A man reached the first station 12 minutes late for the proper starting time and walked to the next station at 4 miles an hour to try to catch the train there.

Did he succeed?

HOW LONG DID THE FROG TAKE?

51. A frog fell into a well that was 30 feet deep. He climbed up 3 feet every day and slipped back 2 feet every night.

How long did he take to reach the top?

THE ANSWERS TO THE PROBLEMS ON PAGE 723

36. It would take 4 hours to walk the 16 miles still to go, but cycling is the quicker way. If James rides 8 miles in 1 hour, and then, leaving the machine, walks right on, he will complete the journey in 3 hours. If John walks for 2 hours he will come to the machine and can ride it the remaining 8 miles in 1 hour, thus arriving at the same time as James.

37. He knew the name of the village from which he had come, and by supposing that the arm of the signpost with that name pointed in the direction from which he had cycled, he was able to tell what roads were indicated by the other arms.

38. The first candle burns for 6 hours and the second for 4 hours. In 2 hours (8.30 to 10.30) the first burns as much as the second burns in 1½ hours (8.30 to 10). Hence, in 6 hours the first burns as much as the second in 4½ hours, so that the second would require one half-hour to burn 1 inch, and it must have been 8 inches long originally, while the first must have been 9 inches long.

39. When his father is three times as old as Harry, the difference between their ages must be twice Harry's age; but the difference between their ages is always 44. Therefore Harry will be 22 when his father is three times as old. Harry, then, will get the bicycle in 10 years' time.

40. Six words. To send a telegram between any two places in this country costs at least 25c. The difference between the price to Albany and to London was $1.25. If we add to this sum the minimum charge for a telegram in this country, 25c, we would have $1.50, which would pay for a telegram of 6 words to London.

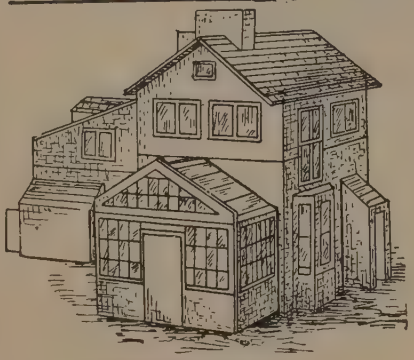
41. The amount spilt would have served the man who died for 8 days, and this, at 1 quart each day, would have been 8 quarts.

42. I would meet 11 trains coming in the opposite direction, not including the one that would be arriving as I started and the one that would be starting as I arrived. There is 24 hours' difference between the starting times of the trains; but as the trains from opposite sides are going towards each other at the same speed, each train will pass another train every 12 hours. Thus, my train will in 6 days pass 12 trains, including the train that will be leaving as I arrive at my destination.

43. Yes, the second farm was the bigger, and was more than twice as large as the other. Three miles square is 3 miles each way and contains 9 square miles, while the other farm contained only 4 square miles.

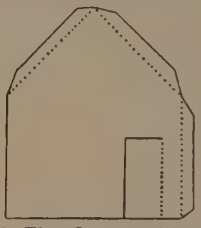
44. He was right. Feathers are weighed by avoirdupois weight and gold by troy weight. An ounce troy has 480 grains, but 1 ounce avoirdupois has only 437½ grains. But a pound troy has only 12 ounces or 5,760 grains, while a pound avoirdupois has 16 ounces or 7,000 grains, so that an ounce of gold is heavier than an ounce of feathers, but a pound of gold is lighter than a pound of feathers.

PLANS FOR MAKING MODELTOWN VILLA

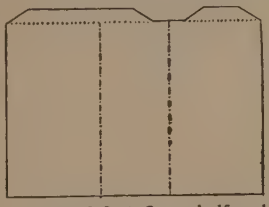


1. The design for Modeltown Villa

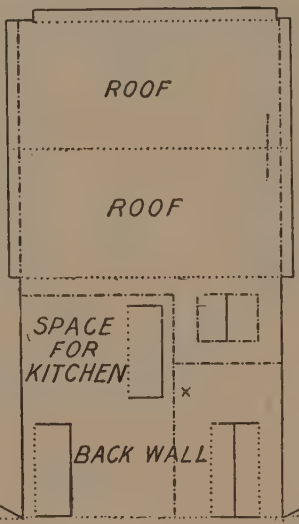
5. Villa with floor and partition fixed



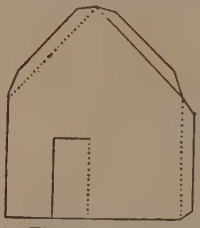
6. First-floor partitions Half-scale. Use rule B for measurements



2. Plan of first floor: half-scale Use rule B to take measurement

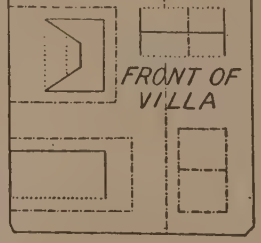


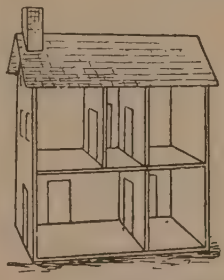
3. Ground-floor partition Half-scale. Use rule B



7. First-floor partitions Half-scale. Use rule B for measurements

4. Plan of villa: half-scale Use rule B for taking measurements





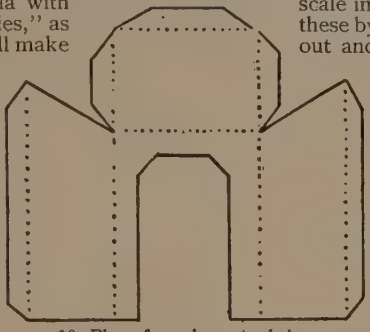
8. Villa with all partitions fixed

9. Plan of chimney : actual size

MAKING A VILLA FOR MODELTOWN

Now let us build a Modeltown villa in which we may live ourselves. If we had to build a real villa we would require to look carefully into the cost, or we might find that we had spent more than we could afford, or more than we could pay for; but in building a villa in Modeltown we may have it just as nice as we desire without considering the question of cost, because five cents worth of cardboard will make a villa with "all the modern conveniencies," as the builders say. So we shall make a fairly large villa with a nice porch, a conservatory, a shed for bicycles, and a kennel for the watch-dog.

Picture 1 is a drawing of the villa when it is finished, so we see here what the result of our work ought to be. Picture 4 is the plan of the walls before bending them up. We draw this plan upon our cardboard, making it to double the scale in the picture—that is, using rule B to take the measurements and making our lines with our full-sized rule.



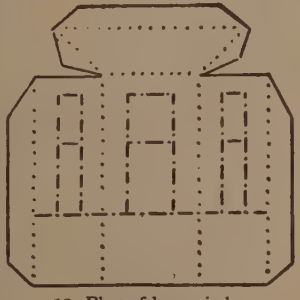
10. Plan of porch: actual size

We remember, of course, the meaning of the three different kinds of lines as explained to us on page 446 and elsewhere. At the places where there are crosses in the plan we make pinholes. After cutting out the card, we bend up the walls and glue the side walls to the floor by the projecting slips. To the walls inside we must glue slips of wood, such as large matches without heads, so that the floor will have something to support it.

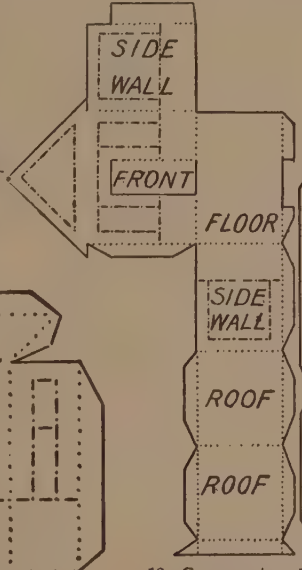
Then we draw and cut out the first floor, the plan of which is given in picture 2, and the partition for the ground floor, which is given in picture 3. We make these double the scale of the picture—that is to say, we use scale-rule B. When we have fixed the first floor and the ground-floor partitions into their proper positions, the building will look as in picture 5, which shows the front wall hinging open. There are two partitions upstairs, and the plans of these are given half-scale in pictures 6 and 7. We draw these by using scale-rule B, cut them out and then glue them into place at the dotted lines marked on the plan of the floor. Now let us make the chimney as seen in picture 9, drawing it the same size as in the picture. We know how to attach the chimney to the roof, and the dotted line on the plan of the house in picture 4 shows where the chimney ought to be glued into position. Picture 8 shows the building with all the partitions in place and with the chimney attached.

We now come to picture 10, which is the plan of the porch over the front door. This we also make full size and glue on over the front door. The dotted lines around the door in plan 4 and the finished house in picture 1 show where the porch is to be placed. The lower window in the front of the house is to be made into a bay or oriel window, and picture 12, which we make the same size, gives the plan for this. Its position is seen in the view of the finished house in picture 1. We shall find the conservatory a little more difficult than the porch and the

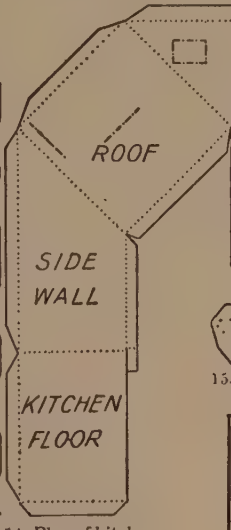
11. Conservatory being made



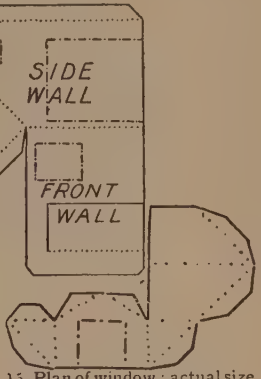
12. Plan of bay window actual size



13. Conservatory half-scale Use scale-rule B

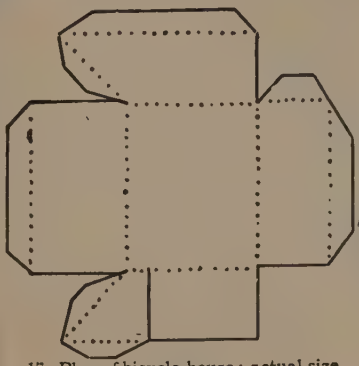


14. Plan of kitchen half-scale Use scale-rule B



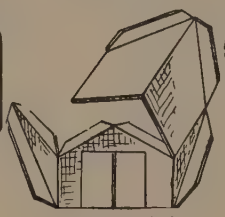
15. Plan of window: actual size

16. Plan of chimney actual size

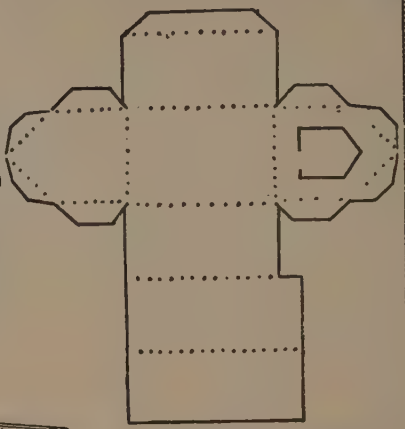


17. Plan of bicycle-house : actual size

18. Chimney

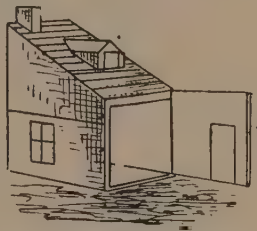


19. Dormer window

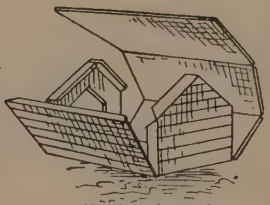


20. Plan of kennel · actual size

21. Dormer window



22. Kitchen complete



23. Folding kennel

24. Finished kennel

bay window. The plan of the conservatory is given half-scale in picture 13. This we make by using scale-rule B for taking the measurements. As we bend it up and glue it into shape it will look like picture 11, and when attached to the side of the house it will be as seen in picture 1.

We have now completed the building of all but the back of the house. We have made no kitchen and we now make this separately. Picture 14 is the plan of the kitchen half-scale size, which we make by using scale-rule B. The kitchen has a dormer window, the plan of which is given in picture 15, and a chimney, the plan of which is in picture 16. We make both the same size as the illustrations. The chimney when bent and glued will be as seen in picture 18. The dormer window when bent and ready to be glued will be as seen in picture 19, and when glued together ready to be attached to the roof it will be as seen in picture 21. Then the entire kitchen with chimney and dormer window is illustrated in picture 22.

Having done all this, we shall glue the kitchen complete to the back of the house, the position being indicated by lines in picture 4 and by picture 1. Our bicycle-shed is to be attached to the side of the kitchen. Its plan is given in picture 17, and we make it the same size as the plan, cut it out and glue it to the side of the kitchen as seen in picture 1.

We may want to keep a dog, and after having made such an elaborate villa it is an easy task to make a kennel. The plan of the kennel is given in picture 20, and our drawing on the cardboard must be made the same size. When we are folding it up it will be as seen in picture 23, and when glued together it will be like picture 24.

Photograph of Modeltown Villa when finished

We have now to paint the walls, windows, and roof. If we put weak glue on the walls but not on the windows, and, before the glue is dry, dust on some dry sand, we shall have a good stuccoed surface. The windows we shall make blue and the roof we shall paint a slate colour, which we can get by mixing some red and black if we have no slate. We can make the outside doors and the porch green, as they are supposed to be wood. We can also make the bicycle-house and the dog-kennel green; but the roof of the bicycle-house we shall make black, because a real bicycle-house would probably have a roof covered with black felt well protected with tar. We have now finished the villa, of which a photograph is shown on this page.

WHAT TO DO WITH A GIRL'S WORK-BASKET

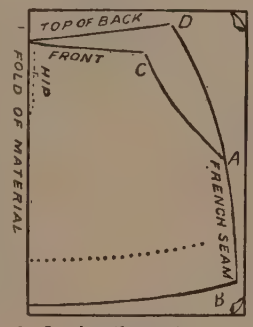
4. The Doll's Knickers

THE next garment we are going to make is the little knickers. These are not quite so easy to do as the chemise or the stays, but, with a little care and attention, we shall soon get over the difficulties.

Picture 1 shows one leg—half of the knickers. Trace a pattern like this, just as we did for the chemise, according to the size of the doll, and cut two pieces of nainsook to the shape of the pattern, allowing a little over for the seams and hems.

1. Pattern of one leg

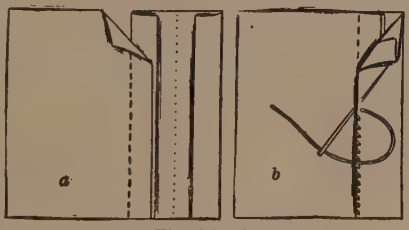
Each piece forms one leg, as shown in the picture. Take one piece, and make a French seam as from A to B in picture 2, which shows the pattern laid on the material for cutting out. This is called *the inside seam.* Then take the other piece for the other leg, being careful to fold the material *the other way.* If you did not do this, the two pieces would fit one leg only.



2. Laying the pattern on the material

Now sew the two legs together, joining them from C to A and from A to D (see picture 2). This is better done by running and felling, if you can manage it, although the French seam answers the same purpose. The legs are now joined, and need finishing at the top and bottom.

The first thing to do is to make a slit in the nainsook about 2 in. long on each side of the knickers—that is to say, make a slit at the top of each leg on the opposite side to the inside seam. A glance at picture 1 will show you the dotted lines *at the side* where the slit is to be made. One side of this slit is finished off with a tiny hem. This is the back of the knickers. The other side of the slit, which is the front part of the garment, is made neat by what is called a false hem, about half an inch wide. A false hem is a hem made of a piece of stuff joined on very neatly to the main part of the work; and the way to fix it is to join the two sides together by little running stitches. Then turn over the material, and make an ordinary hem. Of course you will see why this is necessary. If we tried to make the opening neat by turning in a hem both sides, we should make our knickers too small, and so, to prevent this, we join on extra stuff in this way. Picture 3 makes this quite clear.



3. The false hem
a shows the extra piece run on, and *b* shows it hemmed down

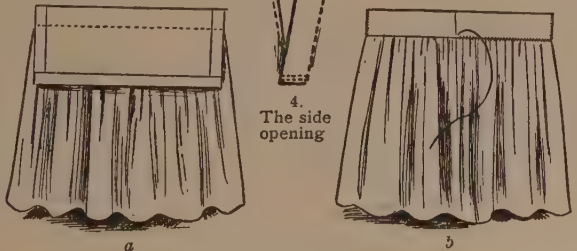
This side—the wide side—of the knickers folds over, and buttons over the other side. To prevent the knickers from splitting right down the leg, the bottom of the false hem should be sewn down on the right side with two rows of stitching, as picture 4 shows.

Now, if you hold up the garment you will find it is in two parts, divided by the slits on either side. The wider part is the back and the narrower the front, and each has to be put into a band to make it fit the doll's waist.

The back part of the knickers, which you will find is much wider than the doll's waist, should be gathered into a little straight band, which must be cut according to the size of the doll. To put this band on, gather the material, and lay the edge of the band against the gathered edge of the knickers, and run them together. Then take the other end of the band, turn in a tiny fold to make it neat, and hem it down to the gathers on the other side, taking up each little gather on the needle separately. The picture (5) makes this quite clear. But there is one thing we must not forget, and that is to "stroke" down the little gathers before the band is put on.

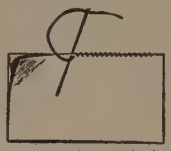
4. The side opening

When the gathering is done, pull up the thread as far as it will go. Then take a pin and stroke down *each* little fold evenly, just as if you wanted to make the material look like a piece of paper that had been folded up in tiny folds like a concertina. Use the *side* of the pin or you will tear the material.



5. The waist-band
a shows the band run on, and *b* shows it being hemmed down

The two ends of the band are then folded in, and sewn over with tiny "sewing" stitches. Picture 6 shows how this stitch is done.



6. Sewing stitch

Now we have finished the back band. The front one must be treated in just the same way, except that the material will not need to be gathered, but only "eased" according to the size of the doll's waist.

The next thing to be done is to finish off the bottom of the legs. If you hold up the little garment again you will see that the ends are much too wide. This fulness must be gathered with running stitches and put into a little band. Cut a straight piece of material for this, which should be about half the width of the other bands we made. Make each one long enough to fit the doll's leg, and join the ends by running stitches.

7. The finished garment

Turn in a little piece, top and bottom, and then put the gathers on to it by stitching or feather-stitching top and bottom.

But we must not forget the buttonholes which fasten the knickers on to the little stays. These are not at all difficult, for we have already learned to do them on page 717.

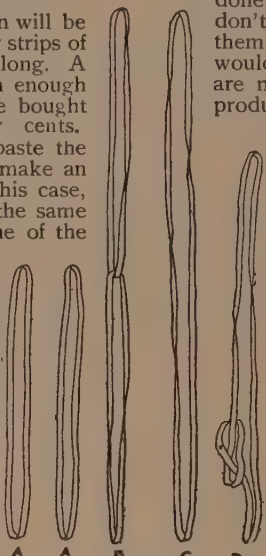
In the middle of the front band we must put a buttonhole with barred ends, like the picture (4) which is shown on page 717, and one at each of the four corners of the bands.

All that now remains to be done is to trim the garment. This must, of course, match the trimming on the chemise—either buttonhole scallops or lace. This we learned on page 577. When this is done our little knickers are complete, and should look as shown in our last picture (7).

THE BOY CONJURER'S MAGIC SCISSORS

THE trick we are going to describe is more usually known as "The Afghan Bands," but the title of "The Magic Scissors" is better, as it tends to persuade the spectators that the secret lies in the scissors used, though, as a matter of fact, they are quite an ordinary pair.

A little preliminary preparation will be necessary, as follows. Take four strips of stout inch-wide paper, each 6 ft. long. A coil of suitable paper, in length enough for several performances, may be bought at a stationer's for a few cents. Taking one of these strips, we paste the one end over the other so as to make an endless band, taking care, in this case, not to twist the paper. We do the same with a second strip, but give one of the ends a half-turn before joining them. In the case of the third strip we must give it a complete turn, and in that of the fourth a turn and a half. The bands so prepared we will call respectively numbers 1, 2, 3, and 4. To help us to distinguish them in use, we may, if we please, mark the three last with two, three, and four little dots or pinpricks respectively.



Bands cut with the magic scissors

When about to show the trick, we come forward with the four bands hanging in regular order over one arm, and lay them on a table or across the back of a chair. We remark that we are about to exhibit a very curious experiment with these pieces of paper. "Experiment" is a more imposing word than "trick." We take band number 1, and, with a pair of scissors, snip a small hole midway anywhere in its breadth, after which we proceed to divide it into two portions by cutting onwards from the hole so made throughout the length of the paper. The bands, thus divided, appears like those marked A in the picture.

"Nothing very remarkable about that," we remark. "Just what you would expect, isn't it? But now I am going to show you something you would *not* expect. It's all done by virtue of these scissors. You don't notice anything particular about them? No; I didn't suppose you would. But, as a matter of fact, these are magic scissors, and, naturally, they produce all sorts of magical results. I am going to show you one of them. I take another of these bands" [here we take number 2], "and cut it just the same as before; but, you see, the result is quite different. We have again two separate bands, but the one is linked within the other." The result is two bands, as before, but one of them is linked within the other, as seen at B.

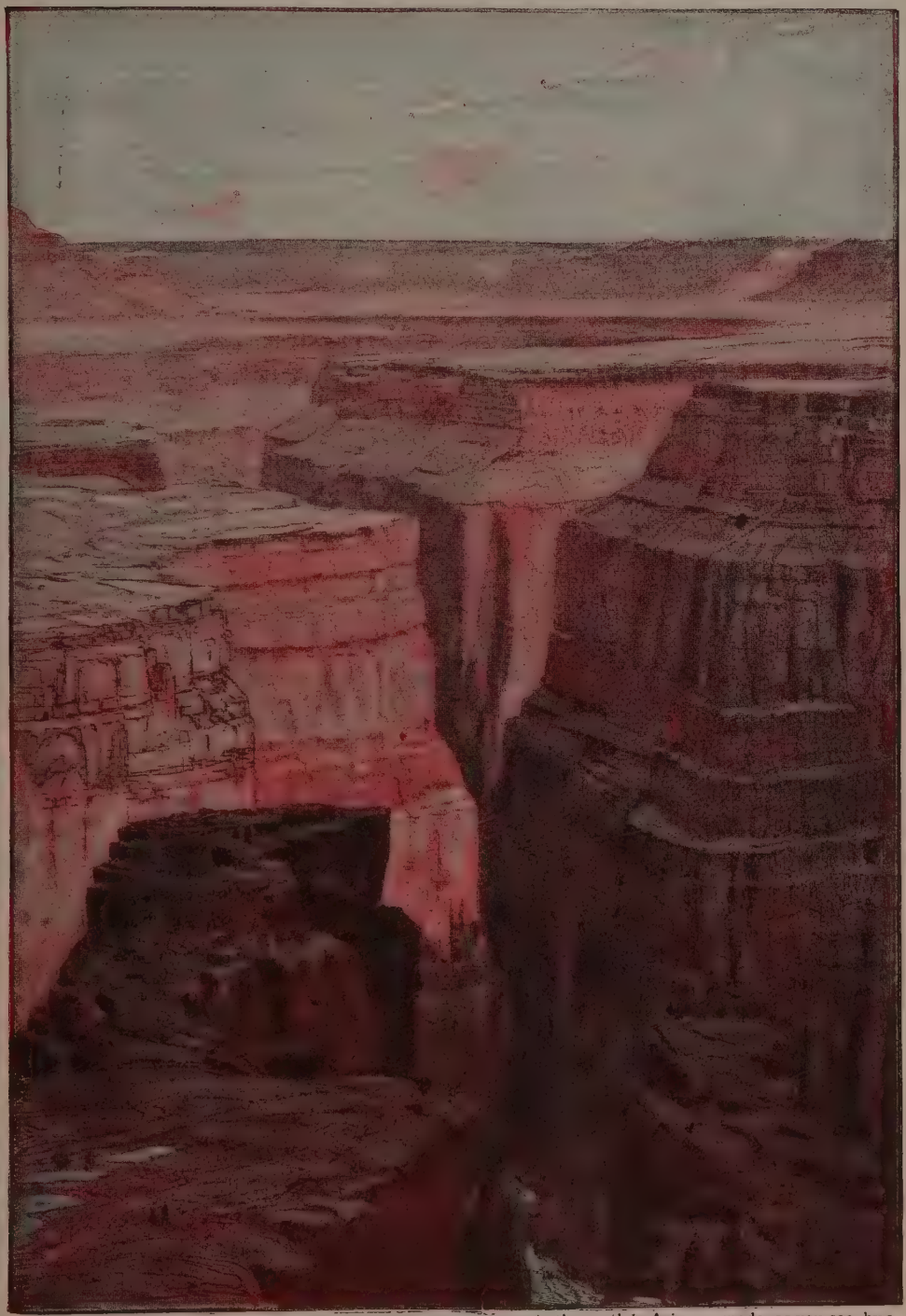
"Now I will show you a still more surprising result. I take another band" [here we take No. 3], "and cut this one also; but the result is again different." The band is now converted into one of double the original length, and appears as shown at C.

"And now for the most surprising effect of all. This time I shall not only make the paper band increase in length like the last one, but the magic scissors will tie a magic knot upon it. Please notice that I do nothing to produce the result. It's all done by the magic scissors." The last paper band now appears as shown in D in the figure.

The frequent reference to the scissors diverts attention from the minute difference between the four bands. The reason, by the way, for making them so large is that the necessary twists become less noticeable.

THE NEXT THINGS TO MAKE AND TO DO BEGIN ON PAGE 927.

A RAVINE IN THE EARTH A MILE DEEP



One of the most wonderful sights in the world is this great chasm in the earth in Arizona, made, as you see, by a great river carrying away the soft rock, and deepening its bed as it flowed along. This great wonder of the world in the western part of America is in a huge district of desolate plains, called Mesas, from 7,000 to 10,000 feet high, surrounded by high mountains and trenched by immense narrow gorges from 4,000 to 7,000 feet deep. The Grand Canon of the Colorado, as this is called, stretches for two hundred miles, and is in some places about ten miles wide, and over a mile deep, and down at the bottom of it, rushes a mighty river.

WHAT THIS STORY TELLS US

WE must be quite sure what we mean by the earth. It will not do to think, as men used to think in the old times, that the earth is merely the ground we walk on. We mean by the earth the whole of the great earth-ball that spins through space, all the rivers and seas, and the air which floats about it. The air is as real as a stone wall, and it can break a window. When a great gun is fired it sets air waves in motion, and the trembling of the air, if it hits a window, will break it as a stone would do. We read here of the stuff the earth is made of. Everything is matter; the difference is in the state in which the matter exists. If we melt a sovereign until it runs like water it is still gold, and so it is with all matter. The matter of the earth is in three forms—solid, like stone; liquid, like water; and gas, like air. All matter exists in these three states, just as water may exist in three states—either drinking water, or steam, or ice, and still remain water.

WHAT THE EARTH IS MADE OF

CONTINUED FROM PAGE 640

WE have said a good deal about one particular kind of stuff which is found in the earth. We can scarcely say it is a kind of stuff of which the earth is made, since it probably does not form more than one part in a million million, even of the earth's crust only; and no one knows whether there is any in the inside of the earth. We had to talk about this wonderful element, radium, however, because its existence even in these tiny quantities tells us so much, and will tell us more, about the past of the earth, and because it is so important for the earth's present and future. But now I want to begin to tell you about the chief kinds of stuff which compose the main substance of the earth—this composition ball, as we called it.

But, first of all, we must get some simple root ideas into our heads, or we shall not know where we are. To begin with, after this, I shall assume that you know what the word *matter* means. Matter is simply *stuff*. The earth is made of it, and so is the sun; our bodies are made of it, and so is the air. Everything is matter, and here we must use the word in this wide sense.

Now, we have learnt already that matter may exist in three states—solid, liquid, or in the form of a gas. When matter is in the form of gas we call it gaseous, and as that is not a very difficult word, I shall use it. Now, when we speak about the three *states* of matter, we do not mean the different *kinds* of matter. That is quite another question, to which we are coming. Any kind of matter may be in any of these states, and quite possibly, also, in other states which we know nothing about.

We need not talk about these states at present, except just to be quite sure about one thing. This one thing is that matter in the gaseous state, such as air, as we usually know it, *is still matter*—just as real as if it were liquid or solid. It has weight and substance in it, and we can make no greater mistake than to suppose that merely because we cannot see it or feel it, it is not real. If it were not there we should all die at once. We speak of "airy nothings," as much as to say that the air is really nothing. This is simply nonsense. You may make air so cold that it becomes liquid, like water, or even solid, like ice, but gaseous air is just as real in every possible way as liquid air or solid air, and gaseous water is just as much real, just as much water, and just as much matter, as ordinary liquid water or ice.

We are all apt to be very stupid in this way, however, and until we get

our notions right we shall never make any progress in the study of matter. We will persist in thinking that what we cannot see or what we cannot feel cannot be real. If you push against the wall with your thumb you feel resistance, and you have no doubt that the wall is real, and that it is made of real matter; but when you look at the wall and see nothing between you and it, you can scarcely persuade yourself that the space between is filled with matter just as real as the matter of your own body or the matter of the wall.

WHAT HAPPENS WHEN A CANDLE BURNS AWAY

When you move your arm through the air you feel no resistance, and so you think that the air is nothing, or does not count, anyway. Now, I want us all to understand clearly and never to forget that matter may be in three states or conditions—solid, liquid, and gaseous, and that, whether we can see it or not, all these are equally real and equally material; and I must give you one more example to prove this.

When you burn a candle it disappears. Now, what has happened? Some people would think that the candle has vanished into nothing, but that is nonsense. *Nothing is made out of nothing*, and *nothing returns to nothing*. The matter of a candle cannot be destroyed; it can be made *invisible*, so that it is not seen, but that is a very different thing. Certainly it looks as if the matter of the candle was something and now is nothing; yet we can collect what comes from the candle when it burns, and we can weigh it, though we cannot see it, and we can prove absolutely that not a speck of what was in the candle has been *lost*, but that it has merely been *changed*.

Now, after this, I am sure that you will make no mistake, but that you will regard the ocean of air or gas, for instance, at the bottom of which we live, as real and material—just as much as the ocean of water in which the fishes live.

Matter is the same everywhere, but takes many forms. Here are three different things—a diamond, a lead pencil, and a piece of coal, all made of the same stuff.

So, when we start our study of the stuff of which the earth is made, we are to be quite sure that we know what we mean by the earth. We mean the whole material ball, including the stuff we usually call "earth," the water, and the air, or atmosphere—that is to say, we are to think of all the matter of which the ball is made, whether it be solid or liquid or gaseous. We are to think of ourselves as living on the outside of the solid earth, or floating (sometimes) on the surface of the liquid part of the earth, but not as being on the outside of the entire earth. On the contrary, there is a great stretch of what is really part of the earth above our heads.

Now, what is this whole ball made of? It is made of matter in three states—solid, liquid, and gaseous; and probably a great deal of matter in the very inside of it, which is in some other kind of state that we do not understand and cannot imagine, that is neither solid nor liquid nor gaseous.

Now, the mere *state* the matter is in is not the point. The point is the different *kinds* of matter that we find; and perhaps we shall discover that many of these kinds of matter are to be found in all the various states; partly as solid and partly as liquid and partly as gas.

WE CANNOT MAKE GOLD INTO SILVER OR SILVER INTO GOLD

But if the question of solid, liquid, and gas is not what we mean when we talk of the kinds of matter, what *do* we mean?

Well, the difference between a dime and a gold eagle will show what I mean. Here are two things which are both solid, both made of a heavy and shining kind of stuff, but one is silver and the other gold. You may melt the eagle; you may even turn it into a gas, and then you may melt it again and make it solid again, but the matter of which it is made will never turn into anything but gold. You may do exactly the same with the dime; you may have solid silver, liquid silver, gaseous silver, but it always remains silver; it will never turn into gold or anything else. We now know, then, that there are at least two different kinds of matter which help to make up the earth,

and which cannot be turned one into the other.

Let us take another instance, so that we may not be deceived. Here are three different things, a diamond, a piece of the stuff out of a lead pencil, and some coal-dust.

YOUR LEAD PENCIL IS MADE OF THE SAME STUFF AS A DIAMOND

Now, these are very different to look at, very different in value, very different in the things which you can do with them, and the places where they are found. They are far more different than the dime and the gold eagle were—at any rate, so far as appearances are concerned. Yet if I take this diamond and heat it I can make it turn into black stuff, which is really just the same as coal-dust, and then I can turn that black stuff, or coal-dust itself, into the same kind of stuff as they put into lead pencils, or I can even take coal-dust and turn it into very small diamonds. These three things, then, are not really different kinds of stuff at all. They are actually one and the same stuff—it is called carbon—in different forms; they are really just as much one and the same thing as ice and liquid water and water-vapour or gaseous water.

Here, then, is a puzzle, and we must be careful. All over the world, in a thousand instances, we can find things which look very different, and yet when we treat them in the right way we find that they are not really different, but are just one and the same thing under different forms. And, as if that were not difficulty enough, we find lots of cases where two things look exactly the same—just as water and liquid air look just the same—and yet, when we come to examine them more closely, we find that they are quite different, and have nothing to do with each other.

THE SIMPLE ELEMENTS THAT CAN NEVER BE CHANGED

This question of finding out the real differences between the various kinds of matter of which the earth is made has engaged the attention of men of science from the beginning, and is now practically settled. On the one hand, we have learnt how to recognise one and the same kind of matter, such as carbon, even though it forms black dust at one time and beautiful large, hard, colourless, transparent crystals at another time. And, on the other hand, we have learnt to distinguish between what are really quite different kinds of matter, even though, to all appearances, a thing that is made of one looks exactly the same as a thing that is made of the other. You will readily understand what an important question this is, and that, indeed, it was the very first question which had to be answered by the science called chemistry, which is concerned with studying the different kinds of matter.

When we have reduced any piece of stuff to one or more kinds of matter which will not be reduced to anything simpler, we call those kinds elements, meaning the *simple things*—you know what the word elementary means. We take a certain kind of precious yellow stuff, which is called gold; we can make it hot or make it cold; we can burn it or hammer it or do whatever we please to it, but it always remains gold. It never breaks up into two or more simpler things than gold, and so gold is an element.

THE FOUR THINGS THE GREEKS THOUGHT THE EARTH WAS MADE OF

The same is the case with the carbon that makes diamonds and coal and lead pencil—a very bad name that is for pencils, since there is no lead in lead pencil, but only carbon. And real lead, the stuff that pipes are made of, is another element, and so is copper, and so on. But before we study the principal kinds of elements, we must know what men used to believe were elements. This is not in order that we may laugh at them and show that they were wrong, but because the way in which they gradually learnt they were wrong is very interesting to us.

As long ago as the times of the Greeks—who, though they knew very much less than we do nowadays, were yet far the cleverest and most wonderful people that ever lived, and really began the study of most of the things that we study now—it was supposed that there were just four elements, and if you think of one of the games you play you can guess their names—earth, air, fire, and water. Now, of course, we find these four things composing the earth to-day, and we cannot do better than talk for a little about each of them. Let us begin with earth.

The next story of the earth is on page 937.

ENGLAND'S GOLDEN AGE OF PAGEANTRY

The warships used in the days of Henry VIII. were very different from those of our own time. The steamship had not been invented, so they were all sailing vessels, and, as the picture shows, they stood high out of the water, with many port-holes for small cannon. Here Henry VIII. is seen embarking at Dover to go to Calais.

In this picture we see Queen Elizabeth, seated on her throne, and surrounded by her Court, receiving the French Ambassador after the terrible murder of the Protestants on St. Bartholomew's Day in the year 1572. All the Court wore mourning to show the nation's horror of this awful deed. The picture was painted by Mr. W. F. Yeames, R.A.

This old picture, now in Hampton Court Palace, represents the Field of the Cloth of Gold, in France. Here, in 1520, Henry VIII. met King Francis I. of France, and the magnificence displayed by the two kings caused the place to be called the Field of the Cloth of Gold. There were nearly 3,000 tents, many of them covered with cloth of gold.

FROM HENRY VII. TO QUEEN ELIZABETH

THESE pages tell us the story of three generations of life in Great Britain, when England was ruled by the Tudors—the family name of the ruling house from Henry VII. to Queen Elizabeth. There were still troubles between kings and people, but the times of the Tudors were the beginnings of a great advance. Ever since the Normans went into England a constant stream of soldiers and traders, teachers and scholars had followed from other lands, and the people learned more and more of other countries and peoples. Great sailors and discoverers sailed the seas, and there was a great growth of the trade which has helped so much to make the nation prosperous. Yet there were still tyrant kings, and the nation was to pass through many trials and calamities; and even the developments that took place in the reign of Elizabeth can hardly make one forget the crime and wickedness which come into this part of our story.

THE TIMES OF THE TUDORS

CONTINUED FROM PAGE 756

As one mounts the steps leading to the chapel of Henry VII., in Westminster Abbey, he seems to pass into a new England. The decorations of the chapel, particularly those on the beautiful gates, form a sort of link between the old and the new. The dragon of the last king of the old Britons takes one back to the beginning of English history.

The lilies of France and the lions of England remind us of the long connection and long struggles of the two countries. The crown on a bush recalls the story of Henry's hasty coronation on the battlefield of Bosworth, where Richard died in the thickest of the fight, and his crown was found hanging on a hawthorn-tree. The Tudor roses are everywhere, formed of red and white roses, badges of the two parties in the long civil wars.

When you have admired the roof, the windows, the carved stalls, you will turn to the large tomb within a screen, planned by Henry himself, in which he and his wife both rest. Elizabeth, sister of the little boys murdered in the Tower, was the first to be buried in her husband's splendid new chapel. The figures on the black marble tomb are both portraits.

A fine portrait, too, is that of Henry's mother, Margaret Beaufort, in the south aisle of the chapel. It was through his mother that Henry claimed his right to the crown, and as you look at her calm, thoughtful old face, her delicate hands raised in prayer, think of her as one who loved and helped the poor, as the friend of Caxton, the printer, as the foundress of colleges at Cambridge. Of her the famous words were said: "Everyone who knew her loved her, and everything that she said or did became her." Two of the badges on Henry's gates belonged to his mother: one is the root of daisies, the other is the portcullis, a sort of sliding door, used in old times to hang over the gate of a castle, and add to its strength and security.

During the lifetimes of Margaret, her son, her grandson, and his three children, the need for strong gateways and portcullises passed away. The old feudal barons, who used to sally forth from castles shut in by moats and gates to put themselves at the head of their knights and servants, were nearly all killed off in battle during the Wars of the Roses. The nobles who rose in their stead built themselves open country houses, surrounded by parks and gardens which are still among the chief beauties of England.

The old barons, though some were bad and violent, had done a great

work for their country. It was they who wrung from the kings charter after charter, promising justice, good laws, and just government for the people. It was they, too, who insisted on the kings calling Parliaments to make the laws, and to decide what money should be paid in taxes, and how it should be spent.

THE TUDOR KINGS WHO STOPPED THE GROWTH OF FREEDOM

Now, when the order of strong old nobles was laid low, the new ones owed so much to the Tudor kings that they did not dare to resist them at first, and, as the character of this very clever family was strong and determined, the growth of freedom was stopped for many years.

Henry VII. was very grasping about money; he needed it badly, and made people angry and discontented by the way he forced it from them. He had a hard task to set England straight and to keep it at peace. He saw that nothing could improve if fresh wars were undertaken. So he tried to quieten Scotland and Spain by marrying his children into their royal families. He little thought how far-reaching the results of these marriages would be. His daughter Margaret, named after her grandmother, was married to James IV. of Scotland, and his eldest son, who died young, to a Spanish princess, Catherine of Aragon.

To understand how great a change came about in the world in the times of the Tudors, we must go back to the beginning of the country's story, when the nation was still young. No one then knew anything about the shores of the other side of the sea which lay round about them. Then, as time went on, glimpses of the empire beyond, of which they formed a part, came to the Britons when conquered by the Romans. The Saxons and Danes, from the other side of the North Sea, handed on in their new home the tales of the wild and cold motherland they had left.

THE STREAM OF SOLDIERS, SAILORS, AND SCHOLARS THAT WENT INTO ENGLAND

The influx of the Normans sent a never-ending stream of soldiers and traders, teachers and scholars, constantly crossing and recrossing the Channel. The views gained through them of the continent beyond were ever made larger and clearer, as the Crusaders pressed on to the East, armies spread all over France, and trade steadily increased. All this time, up to the reign of Henry VII., England was slowly learning more about the earth.

There were some very wise men through the centuries who understood that the world was not really flat. One of them had even found out a way to measure its size and weight. There were also some very adventurous men, who had from time to time sailed away towards the Unknown, and come back with tales of what they had seen. Columbus and his friends showed a new world to the old, as they returned, voyage after voyage, with news of what they had seen at the end of "Nowhere," at the "Back of Beyond."

The excitement of this new wonder, the longing to know more about it, and to share in the riches and glory of the discoveries, spread all over the times of the Tudors in the fifteenth and sixteenth centuries.

THE BLACK CLOUD THAT HANGS OVER THE TIMES OF THE TUDORS

Men's minds were still further awakened in these days by the opportunity that came to them to study, in the beautiful old Greek language, the learning that had been hidden away and neglected for long years. There was a new learning to delight scholars, as well as a new world to astonish the people. There was a new form of religion, too. It began with Wyclif and his translation of the Bible, and men thought about it a long while, trying to decide what was wrong in the old form of religion, and how things could be put right.

Presently, as we shall see, people had to do more than think—they had to act. We, who live in this twentieth century, when everyone is free to worship God as he thinks right, find it hard to understand that only four centuries ago Englishmen believed they were pleasing God by putting people to death, if they refused to agree with them. The sadness of the religious struggles in those days hangs like a black cloud over the times of the Tudors.

Catherine of Aragon's bridegroom, Arthur, died before his father, and the

There is something fine in this picture of the boyhood of Sir Walter Raleigh, who afterwards became a great explorer and won many victories over the Spanish. He is sitting with a companion, listening to a sailor, who is telling them of the wonderful lands across the ocean. This picture is painted by the great artist Sir J. E. Millais.

One May morning in the year 1497, the age of the early explorers, John and Sebastian Cabot sailed from Bristol on a voyage of discovery. In this picture, by Ernest Board, we see people bidding farewell to the explorers. The ships steered north-west in the hope of reaching China, and in this way Newfoundland was discovered.

Pope was asked to say that it would be right for her to marry her brother-in-law, afterwards Henry VIII. He was a tall, stout, fair man, with a flat velvet cap, very handsome clothes, with puffed-out sleeves, and shoes with broad toes. He had great quarrels about the number of his wives.

Let us fancy ourselves in the Tudor Room at the National Portrait Gallery, in London, and there study the faces of Henry VIII. and his family, and of those with whom they spent their lives. The figure of Henry VIII. is quite life-like. If you look closely, you will see in his face the self-will and self-pleasing that spoilt the promise of his young bright days, when he came to the throne.

Catherine of Aragon, his faithful wife for twenty years, hangs near, in her Tudor head-dress and square-cut bodice. Overhead, in the bright red of a cardinal's dress, is Wolsey. Henry heaped presents upon him for many years, and they were most intimate friends. Wolsey encouraged Henry to rule without Parliament, and gathered all possible power into his own hands, so that he might make the king supreme.

HENRY GIVES UP HIS WIFE AND HIS GREAT COUNSELLOR WOLSEY

When Henry became tired of Catherine, he wanted the Pope to say that she was not really his wife, because she had been his brother's wife first. This the Pope refused to say, and at last Henry made up his mind not to consider the Pope as the head of the Church any longer, but made Parliament declare himself to be the head, so that he could do as he liked. But Wolsey was against his marrying Anne Boleyn. Henry, in anger, took Wolsey's high offices from him, and he died in sorrow and disgrace. Shakespeare has written of him in a great play, and has reminded us that some of Wolsey's last words are said to have been these: "Had I but served my God as diligently as I have served the king, He would not have given me over in my grey hairs."

Thomas Cromwell was the next favourite of the king, and for ten years helped Henry to sweep away the old freedom of the country. People were made to pay taxes as the king and Cromwell chose; these two made what laws they pleased, and imprisoned anyone they wished; they even beheaded some of the noblest of the land who dared to oppose them.

HOW SIR THOMAS MORE WENT TO HIS DOOM IN THE TOWER

Look well at the earnest face of Sir Thomas More; he was one of the greatest Englishmen of the day, and for a time a close friend of the king. Henry used to walk with him in his garden by the riverside at Chelsea with his arm round his shoulder. Other friends loved to visit him there, too, and talk of the new learning and of the book More had written, trying to show how best to help the country and teach the people. But there came a time when he could no longer walk familiarly with the king; he felt it impossible to say that he thought it right that he should have married Anne Boleyn. So we sadly watch him go down the steps into his boat, having shut the gate on the children he so dearly loved, and pass along the Thames, so clear and silvery then, on his way to the Tower, where he was beheaded.

Those who travelled much about England during the next three years saw many strange and sad sights. The king's men were met on the high roads, carrying beautiful embroideries hanging from their saddles; the sounds of hammering and smashing were followed by bonfires in the fields, for the order had gone forth that the monasteries were no longer to exist. The monks and nuns were turned out from the buildings, now spoiled of their treasures and ornaments, and in many cases left to go to ruin. These monks and nuns had led useful lives in the past.

THE MONASTERIES THAT SHELTERED THE SCHOLARS IN STORMY TIMES

You will remember how useful they had been in the past; how they had sheltered in stormy times the scholars who wrote and painted the manuscripts from which we can glean so much of the early history of the country. Besides teaching those who wished to learn, they entertained travellers and looked after the poor. But because some of the monks were lazy and bad, this was made an excuse to shut up all their houses and take away the estates and other property that belonged to them. Henry gave some of this wealth to his friends; some was spent in founding

new bishoprics; some went to build schools and colleges and ships.

In the midst of all this scene of change Henry's son, Edward, was born at Hampton Court, the beautiful palace which once belonged to Wolsey. It is open now for all who wish to see it, and is full of memories of the king, who played tennis in the fine court, and sauntered about this lovely riverside and park, over 300 years ago. Edward's mother, Jane Seymour, died soon after he was born. After this Thomas Cromwell displeased Henry, and was sent to prison and beheaded. Great efforts were made in the time of Henry VIII. to subdue the rebellious lords in Ireland and to make the people obey English laws, and even alter their customs and religion to order. This they hated doing, and discontent smouldered on in the beautiful and unhappy sister island.

Edward, sickly and pale, succeeded his father when he was nine, being crowned by Archbishop Cranmer, who arranged the Book of Common Prayer much in the same order as it is to-day.

THE FIRST BLUECOAT BOYS WHO WALKED THE STREETS OF ENGLAND

As Edward was too young to govern by himself, the affairs of the country were managed by his guardians. There was much distress in the country, for the people had not enough work, and they missed the help they had had from the monasteries. Much more of the land was now used for grazing sheep, as the new owners wanted to get rich by selling the wool. When the land was tilled, many more people could find work. Another trouble was that the new landlords enclosed some of the old commons, where the people had had rights ever since the days of the Saxons. They felt this terribly, and in many places there were riots.

The Bluecoat School was founded by Edward VI., and many other schools all over the country. The long coats, bands, and yellow stockings were the ordinary boy's dress in this reign, so in London to-day if one sees a Bluecoat boy in the street he may fancy he is looking at the schoolboys of 300 years ago. In his portraits the young king, with his rich clothes, looks something like a small copy of his father. Edward's health became worse and worse. When the ships of Willoughby and Chancellor were towed down the Thames on their way to open up trade with Russia at Archangel, the courtiers rushed out of the palace at Greenwich to see them pass and to receive the salutes of the sailors in "sky-coloured cloth." Edward heard the cannon from his bed, and when Chancellor returned it was his sister Mary who received him and his sailors as Queen of England.

THE SAD FIGURE OF LADY JANE GREY, AND THE COMING OF MARY

Edward had been persuaded to make a will leaving the kingdom to his cousin, Lady Jane Grey, who was a Protestant. The rightful heir, Mary, clung earnestly to the old ways. Poor Jane had no wish to be queen; she was forced into it. You will like her gentle, sweet face. She worked hard with her tutor, whom she dearly loved. He was kinder than her parents, and at eighteen she knew much Latin and Greek.

There are several of her books and letters at the British Museum. One of these is signed "Jane the Queen." Her short reign was passed in the Tower, where she and her young husband were afterwards beheaded. One of her books shown is believed to be the Prayer-book she used on the scaffold.

Mary's girlhood had been sad and lonely for the most part, and after she became queen she had the sorrow of being married to a husband, Philip of Spain, whom she dearly loved, but who cared nothing for her. He spent but little time in the country, but could persuade Mary to do anything he pleased. Together they did all they could to stop the progress of the Reformation and to bring England back again under the power of the Pope.

HOW THE ENGLISH PARLIAMENT KNELT DOWN TO BE PARDONED BY THE POPE

Mary's cousin, Reginald Pole, in the red dress and hat of a cardinal, was sent by the Pope to receive the submission of England. Try to imagine him going up the Thames, in a State barge, a gleaming cross at the prow, to Westminster. There the whole Parliament knelt down to receive from him the Pope's pardon for what had happened in the reigns of Henry VIII. and his son. Does this scene make you think of John, 300 years before?

Numbers of men and women, during this and the reign of Elizabeth, were put to death because they dared to keep to what they believed to be right in religion, and refused to change at the bidding of those in power.

In the midst of all this misery—and who was so wretched as Mary herself?—England lost Calais, called then "the brightest jewel in the English Crown." It was the last of the British possessions in France, and the loss was a heavy blow to the country and to Mary, who died soon afterwards.

QUEEN ELIZABETH, WHO LOVED FINE CLOTHES AND FINE LEARNING

We come now to Queen Elizabeth. What grand clothes, with light bodices, huge sleeves, and uncomfortable upstanding ruffs, she wore! What a wealth of blazing jewels, chains, and ornaments! What a hair-dressing! One can well believe the stories of the numbers of dresses she possessed, and the time and thought spent on her toilet.

Elizabeth's learning and love for books were as remarkable as her love of fine clothes. Among the Royal Books is one of prayers composed in English by Elizabeth's stepmother, Queen Catherine Parr. This book is translated by Elizabeth into Latin, French, and Italian, all written in her own hand when she was fifteen. Later she replied in Greek to the addresses at the universities, and appreciated to the full the writings of the men who made her reign so great and famous.

HOW SHAKESPEARE STOOD TO WATCH THE MERRYMAKING OF THE QUEEN

There are many beautiful houses still standing, though some are in ruins, where Elizabeth made merry with her Court, for she delighted in going about to pay visits. Can you fancy the rush of countryfolk to see the gay party pass? For the gentlemen wore clothes as smart as the ladies, and the coaches were gilded and painted, and the horses had fine trappings. No wonder these "progresses" helped the people to know and like their gay young queen. It is said that Shakespeare came from his home near by, and, standing among the crowd, saw the acting and shows that went on for days.

On the left side of Elizabeth's portrait in the National Portrait Gallery, the thoughtful grey eyes of Burleigh look steadily at us. The queen had to face many great difficulties all through her long reign, and Burleigh was one of the faithful and good advisers who helped her to put an end to the quarrels about religion, and to keep at peace with other countries as far as possible.

A portrait of another of her friends hangs near the queen's, that of Sir Walter Raleigh, of whom the story is told that, when walking with the queen, he put down his beautiful cloak over a muddy place, so that she could pass over without harm.

All through her reign Elizabeth had troubles connected with Scotland. Henry VII. had married his daughter, Margaret, to James IV. of that country. When James was killed at Flodden, his queen ruled for her little son, James V., till he was grown up. There is a most interesting letter from Catherine of Aragon to her husband, Henry VIII., then away in France, telling him of the victory at Flodden, and sending him part of James' coat for a banner. James V. died early, too, and sadly left his kingdom to his "little lass," Mary Stuart, whom England knew so well as Mary Queen of Scots.

THE QUEEN'S COUSIN, WHO LEFT A THRONE TO DIE IN A TOWER

Scotland in those days was torn in two, like England, between those who followed the Pope and those who did not. Those in favour of him sent little Mary to France to be brought up there, and to marry the French king's eldest son. There is a portrait of Mary in white widow's mourning. Her young husband soon died, and Mary sorrowfully left the gay Court of France and went back to very hard and troubled times in her own kingdom. She was one of the most beautiful women of her time, and had such charming manners that most people were eager to please her. She married her cousin, Darnley, and their little son became James VI. of Scotland.

There is still to be seen a letter from Mary, in French, to Elizabeth, asking for more liberty, and for leave to write to her son, who, she says, was torn from her arms. What had Elizabeth to do with it? And why was the boy away from his mother? It is a long, sad story, and gets sadder and sadder to the end.

A QUEEN'S FAREWELL TO FRANCE

In 1561 Mary Queen of Scots, who on the death of her husband was no longer Queen of France, was invited to return to Scotland. She embarked at Calais. Spreading her couch in the open air, she asked to be waked in the morning if it were fine, that she might take her last farewell of the land she left. The morning was clear, and this picture shows the queen gazing back towards the country she loved, murmuring sadly, again and again "Farewell, France! Farewell, France! I shall never see thee more." At home great troubles arose, and, in consequence of plots to make her Queen of England, Mary was put to death by order of Queen Elizabeth, her cousin.

Mary had many quarrels with her subjects, the chief one being that they believed she had something to do with the murder of her husband, Darnley. Presently she fled to England, and Elizabeth kept her a prisoner in various castles for the rest of her life.

During these long years plots were always going on to make Mary queen instead of her cousin, Elizabeth. At last, when it seemed to be certain that Mary was joining with those who tried to kill Elizabeth, Elizabeth condemned her cousin to be beheaded. This was a great grief to those who loved her.

THE GREAT WEALTH AND THE GREAT CRUELTY OF SPAIN

A year after Mary's execution, England passed through a great and most exciting time. Soon after Elizabeth became queen, Philip, her brother-in-law, had wanted her to marry him, so that England and Spain might join against France. Spain was very powerful then, because it possessed the Netherlands, so rich from commerce in the wool trade, in which England had a share. Spain had, too, the wealth brought by the splendid discoveries of Columbus in the New World. But Elizabeth would not listen; she helped Philip's Protestant subjects in the Netherlands, and Philip in return helped Mary's plots against Elizabeth. The English hated the Spaniards at this time for their cruelty to the Protestants, and also because they tried to keep England out of all the trade they could in the New World. Sailors, such as Hawkes and Drake, pounced on the Spanish treasures when they could, either on shore or at sea, and at last Philip determined to add England to his other dominions by conquest.

HOW SIR FRANCIS DRAKE FINISHED HIS GAME AND BEAT THE SPANIARDS

The story goes that Drake and his captains were playing bowls on Plymouth Hoe when news came that a huge fleet was slowly coming up the Channel, to help to land a great army of Philip's from the Netherlands.

"There is time to finish the game," said Drake, "and beat the Spaniards, too."

Philip had counted on help in England, but he was mistaken, and all flew to arms for queen and country. Ships poured out of every harbour as the Armada sailed in a broad crescent up the Channel. Elizabeth, on horseback, reviewed her troops at Tilbury, encouraging her captains and men by her presence and her speech.

"I know," said she, "that I have but the body of a weak and feeble woman, but I have the heart of a king, and of a king of England, too."

The motto on the medal struck in honour of the great victory and deliverance that followed tells the story of what happened in a few words: "God blew with His wind, and they were scattered." The great ships of the enemy were slow and helpless, and got in each other's way; while the little "sea hawks" of the English darted in and out, and drove the Armada out to sea by sending fire-ships among them, so that they fled away to the North Sea in a terrible storm. Those that were not wrecked escaped round the north of Scotland and west of Ireland. To this day there are traces here and there along the coasts of the disastrous retreat of the Spanish Armada.

THE END OF ELIZABETH'S REIGN AND THE END OF THE TUDORS

Try to imagine the relief and joy of the country, the ringing of bells, the bonfires, the thanksgivings! For thirty years the terror of Spain had hung over it, and now that power was laid low, and England became of real importance among the countries of Europe.

Poor Elizabeth! Notwithstanding all the greatness and glory of her reign, the excitement of discoveries, the satisfaction of success, when the end came it found her a lonely, sad old woman. Most of her friends died before her. She had neither husband nor child to care for. She had never seen Mary's son, who was to succeed her, but she wrote to him two months before her death, begging him not to believe some charges brought against her. She signed herself, "Your loving and friendly sister, Elizabeth."

This was in January. Late in March a rider sped north on relays of horses, night and day, to be the first to tell James Stuart, the King of Scotland, that he was also King of England. The times of the Tudors were ended; the Stuarts had come.

The next Story of England is on page 1021

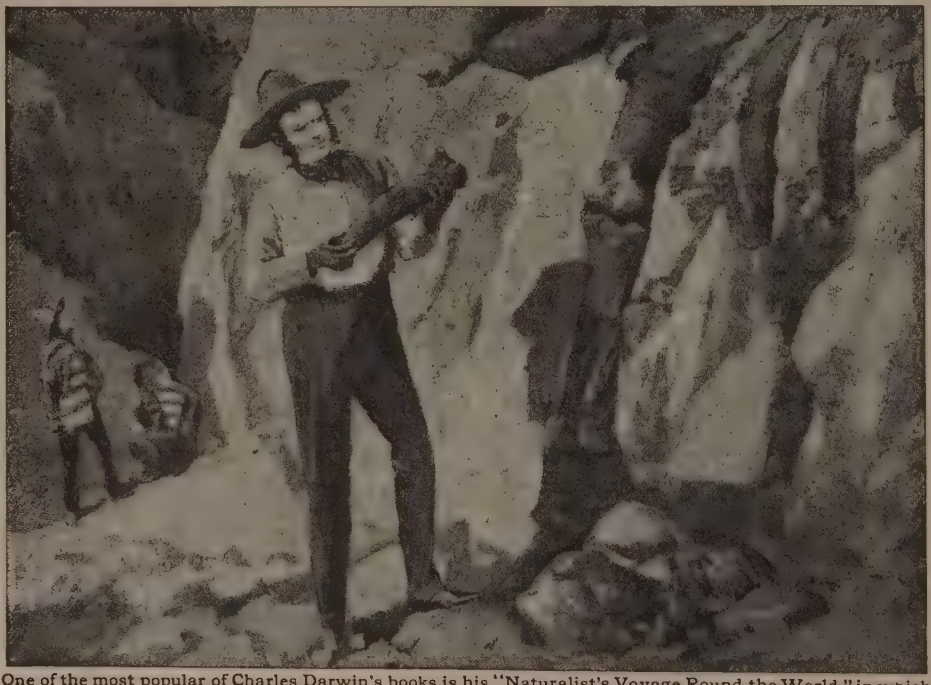
A GAME OF BOWLS & WHAT FOLLOWED IT

Sir Francis Drake was one of the great sailors of Queen Elizabeth's time. When the Spanish Armada, the great fleet Spain sent against England, was sighted, Drake and his officers are said to have been playing bowls on the Hoe at Plymouth. "There is plenty of time to finish the game and beat the Spaniards too," said Drake. This picture, painted by Mr. Seymour Lucas, R.A., is printed by courtesy of Messrs. Henry Graves & Co.

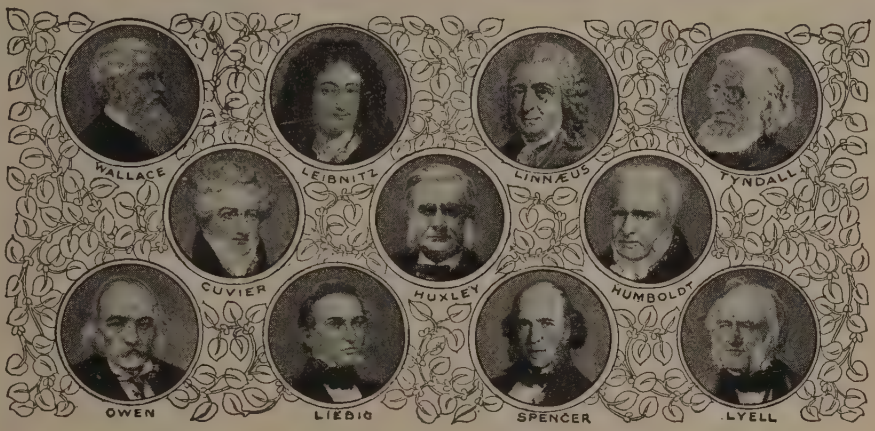
The Spanish Armada was destroyed in a storm. The King of Spain's fleet was utterly broken up and chased through the English Channel by the sailors of the English Fleet. The ships tried to escape round the coast of Scotland, but great storms overtook them and the vessels were dashed to pieces on the rocks. In this picture, by Mr. Albert Goodwin, we see all that was left of one of the largest of the ships of the wrecked Armada.

CHARLES LINNÆUS AND CHARLES DARWIN

Linneaus, the great Swedish scientist, was the father of modern botany, for it was he who first arranged the world's plants in a scientific manner. It was in spite of the greatest difficulties that he followed his favourite study in his youth. In this picture we see Linneaus as a young man, just returned from a long botanical ramble.



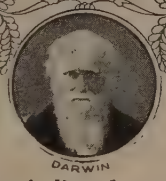
One of the most popular of Charles Darwin's books is his "Naturalist's Voyage Round the World," in which he tells of his experiences and discoveries when he travelled as official scientist with the warship Beagle. He thoroughly studied the geology of South America and found many fossils. Here we see him discovering a fossil mastodon that was exposed on a cliff near Santa Fe. It was in too crumbling a state to be removed.



FAMOUS MEN OF SCIENCE

DARWIN HUXLEY SPENCER TYNDALL OWEN LYELL CUVIER LIEBIG BUCKLAND HUMBOLDT LINNÆUS LEIBNITZ

CONTINUED FROM 764



SOME of the greatest men of all ages have been those who have extended our knowledge of science without inventing anything which can be touched or handled. Yet the value and importance of their discoveries have been more than we can reckon. We shall here glance at the careers of a few such men, remembering that they are merely examples, and not the only men who could have been chosen.

First we shall take Gottfried Wilhelm Leibnitz, a German philosopher, who was born at Leipzig, in July, 1646. As a boy he set himself to study subjects which the ordinary scholar would think too dry. His father died in 1652, and little Gottfried was allowed by his mother to read at will in the family library. The result was, that when, at the age of fifteen, he went to the university, he was soon able to publish two valuable treatises on the philosophy of law. He studied chemistry, philosophy, law, politics, and religion, and soon knew all the great men in Germany.

At this time Louis XIV. of France was thinking of invading some of the German states; but Leibnitz wrote a work suggesting the invasion of Egypt by France. It was not very friendly to Egypt, but it saved Germany; for the king sent for Leibnitz to explain his scheme, and refrained from attacking his country. We shall hear of the plan of Leibnitz later in our story. Leibnitz travelled to London, where he met the great scientists, who had just formed the famous Royal Society. Newton was, of course, of the company, and the friends of Leibnitz and the friends of Newton were destined to quarrel over a great mathematical discovery which both men had made independently. Leibnitz framed a great scheme of philosophy; he gave us laws enabling us to understand the meaning and force of energy; he collected a great deal of material showing the history and relation of the various languages of the world; he helped to establish scientific institutions, like the Royal Society, in various European capitals, and he laboured to better the health of mankind.

Leibnitz died at Hanover in 1716, but nine years earlier a little boy had come into the world, of whom men were to hear much. This was Carl, or Charles, Linnæus, who was born the son of a poor clergyman, at Rashult, Sweden, in May, 1707. The father

had a garden, which he stocked with common and uncommon plants, and here little Carl loved to study Nature. Flowers which had no meaning for others seemed to be an open book of knowledge for him, and many were the experiments he would try, by bringing in new wild flowers from the woods and planting them in his father's borders.

CHARLES LINNÆUS, THE POOR BOY WHO BECAME FAMOUS ALL OVER THE WORLD

In 1727 he was sent to Lund, and afterwards to Upsala University to study medicine, but he devoted himself mostly to the study of botany.

His love of Nature was discovered by a kind professor, through whose help Linnæus was sent on a scientific tour in Lapland. The book which he wrote, giving the result of his travels and investigations, brought him the friendship of a rich Dutch banker, who employed Linnæus to superintend his lovely garden. The naturalist delighted in this work. He classified all the plants and trees and shrubs, and, while so studying, wrote his first great work on the scheme of things in Nature as it seemed to him.

Afterwards he held various professorships; he lectured and practised as a doctor; he was honoured by his sovereign, and was able to buy himself a charming little estate, where he gathered together a wonderful collection of plant and animal life. This collection was afterwards bought for England. His days closed in peace and happiness in 1778; and he was beloved and greatly respected by the whole of Europe.

THE BOOK BY LINNÆUS THAT HELPED ANOTHER BOY TO WIN FAME

Linnæus was the founder of modern botany. He classified all plants and trees in scientific order. He did the same thing for the animal world. He thus laid the foundation of classification for the whole realm of Nature. His work has, of course, been greatly extended and developed; but it is his system which we have followed, and his scientific names which we employ; names which describe in Latin or Greek the nature and characteristics of the animal or plant to which a title has to be given. He it was who brought order out of chaos in Nature's great family. One of the first fruits of the labour of Linnæus was to win for natural history the services of the great Leopold Christian Frédéric Dagobert Cuvier, whose literary title was "Georges Cuvier." He was born at Montbéliard, at that time belonging to Würtemberg, in August, 1769, of French parents. Cuvier proved a diligent student, and assembled all the cleverest boys in his school, and formed what they called an academy of learning.

So deserving a boy was Cuvier that the Duke of Würtemberg sent him to the Stuttgart University, where, to his intense joy, he was given a copy of one of the master works of Linnæus. From that time he devoted himself to the study of natural history. He had to serve for a short time, on growing up, in a Swiss regiment, but when he was eighteen years of age he entered the service of a family in Normandy as private tutor. Here he remained for six years, sheltered from the horrors of the Reign of Terror; and here great events followed a very simple thing.

HOW CUVIER LEARNED TO READ THE WONDERFUL BOOK OF THE EARTH

Some fossils were dug up near his home, and diligent study of these revealed to Cuvier wonders of the past of which no one else had dreamed.

Up to that time fossils, which had clearly at one time been animals, were regarded as freaks of Nature. It never occurred to men that these fossils had any relation to living things, or that their descendants were alive on the earth before their eyes. But Cuvier had got a clue, and he now entered upon a work from which he never turned back. He filled important public offices in France, and did much for the nation when given control of her educational system; but he is of most importance to us as the father of palæontology.

The word palæontology is made up of three Greek words—*palaios*, meaning ancient; *onta*, meaning beings; *logos*, meaning discourse. Hence the word means the science which treats of living things that inhabited the earth in ancient days. All the wonders of the past—of which we read on page 45 and succeeding pages—are revealed to us by the palæontologists, of whom Cuvier was the first. He was also a great comparative anatomist. By comparing the anatomy of various animals, he

was able to discover those features in which they resembled each other, and those in which they differed, and so to classify such animals scientifically.

Here is a little story showing how well his classification helped him to a decision respecting the characteristics of animals.

One of his students determined to give him a fright; so, dressing himself up as an animal, he crept one night into the professor's bedroom.

"Cuvier," he cried, in a hollow voice—"Cuvier, I've come to eat you!"

The naturalist peered at him and laughed.

"What, horns and hoofs—graminivorous—you can't!" he said.

He saw that the supposed monster had horns and hoofs, and he knew that all such animals eat grain or herbage, not flesh.

Cuvier was one of the greatest naturalists that ever lived, but for all his knowledge and for all his intellect, he followed Linnæus in making a serious error. Both believed that a species cannot change. Let us leave this problem for a moment; we shall return to it later when we meet Charles Darwin.

HUMBOLDT, THE GERMAN BOY WHO LISTENED TO TALES OF CAPTAIN COOK

Another great naturalist was born in the same year as Cuvier. This was Friedrich Heinrich Alexander von Humboldt, who was born at Berlin in 1769. While Cuvier dug down into the earth for secrets of the past, Humboldt went exploring to explain the mysteries of present-day life. He was studying at a university which then existed at Frankfort-on-the-Oder, when he met George Forster, who had accompanied Captain Cook on his voyages, and, hearing Forster's tales, Humboldt was fired with a desire to travel.

But he had to wait until he was thirty before he could start. The great French wars of the period made it impossible for anyone to send out ships merely for exploration and study. In 1789, Napoleon, acting on the plan submitted by Leibnitz to Louis XIV., did decide on invading Egypt; and Humboldt should have gone, but at the last moment there was no room for him in the ship.

In the end it was under the flag of Spain that he sailed. Spain owned nearly the whole of South America, except Brazil, at the time that he went forth to explore. He made a wonderful journey, lasting nearly five years. He explored Venezuela, Colombia, Ecuador, Peru, Cuba, and Mexico. He learned the manners and customs of their peoples, saw the relics of the marvellous old civilisation dating back to times before the arrival of Columbus in America. He learned all about their wonderful birds and animals and fishes.

THE WONDERS OF LIFE IN AMERICA OF WHICH HUMBOLDT TOLD THE WORLD

Among other things, he saw the electric eels in their native rivers, and collected specimens of birds, fishes, and animals previously unknown to Europe. He made scientific observations which led to the establishment of magnetic surveys by all the nations. He braved many perils in exploring the mighty waters of the rivers Orinoco and Amazon and their tributary rivers; and during his travels his right arm was poisoned, partly crippling it for the rest of his life.

When he returned to Europe, taking with him his collection, he had years of work before him in order to give to the world the result of his investigations, in geography, in the manners and customs of the peoples, and, above all, in natural history. His books ran to thirty great volumes, with hundreds upon hundreds of illustrations. When he was sixty years of age, Humboldt undertook another exploration, this time in Northern and Central Asia. Here, again, his travels, though rapid, were of importance in giving us knowledge of the subjects in which he was interested.

THE BUSY GREAT MAN FOR WHOM A SERVANT WOULD NOT TELL A LIE

The greater part of the last thirty years of his life was spent in Berlin, where he died in 1859; but he loved Paris, and would steal away to work there in peace and quiet. He was always accompanied by a faithful, honest old Swiss servant, who would not tell a lie. So when the people used to call at the little house in Paris where Humboldt was secretly working, the servant would say, in answer to inquiries: "Yes, my master *is* in, but he wants me to say that he isn't."

That great geologist, Sir Charles Lyell, went, like Cuvier, to the rocks for his facts, but his purpose was to tell the story of the earth itself. He was

born in Forfarshire in 1797, and at Oxford University became a good classical scholar. His parents wished him to follow the law; but though he did become a barrister, his heart was not in lawyers' laws, but in Nature's laws. At Oxford he had heard the lectures in geology of William Buckland, the famous scientist who, in his later years, became Dean of Westminster.

How Lyell built up the story of the earth out of the rocks

Buckland afterwards took Lyell for a trip to Scotland to study geology, and after that the young man's heart was wholly given to science. Through Buckland he met Cuvier and Humboldt, and their friendship and counsel further inspired him. He gave up the law, and took entirely to the study of geology. He travelled all over England and Scotland, and in Europe and America. The outcome of his work was a great book on geology, which for the first time made clear the true story of the earth as we know it to-day.

Previous opinion had been that the form of the earth's surface, her great mountains, her deep valleys, her vast ocean-beds, had been caused by terrible disasters, that the world had been wrenched and twisted and distorted by earthquakes and volcanic eruptions. But Lyell showed that the causes which had made our world what it is are still in operation before our eyes to-day. He showed that, though a volcano may be created in a night, mountains *grow;* that the shrinkage of the earth, and the terrific pressure which it causes, make mountains rise out of flat rocks; that great folds in the solid rock are caused in the same manner; that frost and rain and wind wear down mountains, and cast their debris into the sea, to build up there, at the bottom of the water, land which will some day rise above the sea to form new continents when the existing ones disappear.

Liebig, the shopkeeper's son who became the world's greatest chemist

Buckland made Lyell a geologist. He was also the means of bringing to the help of British agriculture one of the greatest chemists of all time, in the person of Baron Liebig. Liebig was not born a baron, but was the son of a poor drysalter of Darmstadt, Germany, in which town Liebig was born in May, 1803. He loved to try the experiments of which he read in old books, and, after many struggles for education, was befriended by the good-hearted Humboldt. Humboldt introduced Liebig to a rich friend who finished his education, and Liebig was enabled in time to become the greatest chemist and the greatest teacher of chemistry in Europe. He gave new life to chemistry, and trained men from all parts of the world. The thing that he did for England was in relation to agriculture.

In spite of the ordinary farmyard manure, the land was getting poorer and poorer, because the crops took so much out of the soil that could not be replaced. Liebig insisted on the use of artificial fertilisers, chemical substances containing the properties which the land requires.

Now, one day Buckland had noticed ladies wearing, as part of their jewellery, stones which, by their markings, he recognised as fossils. These ornaments were neither more nor less than food which, eaten millions of years ago by animals, had been converted in the earth into fossils. He discovered great stores of these coprolites, as he called them, buried deep in the earth.

The beginning of a great industry, and the birth of a great man

Liebig went to visit Lord Playfair, a great scientist and noble-hearted man, who, among other things, had translated Liebig's writings into English.

When Liebig was visiting Playfair, Buckland showed him his store of fossils. Playfair took away some of the fossils, had them ground up in his laboratory, and found that they abounded in phosphate of lime, the very thing the soil needed. This at once gave Liebig the idea of utilising ground bones for fertilising the soil, and then and there began the great artificial fertiliser industry in England upon which its agriculture so much depends.

While Liebig was at work enriching the soil, there was another great man, Sir Richard Owen, delving in it for more of its secrets. Owen was born at Lancaster, in 1804, and lived to be eighty-eight, and from early manhood to the last years of his life he was pouring out a flood of knowledge for us upon life in the ancient world,

upon the work of the human body as it is to-day, upon geological problems, and upon a thousand matters relating to natural history.

And yet this great scientist had no other ambition in early life than to go to sea, perhaps as a ship's doctor! While waiting for an opening in the Navy, he entered the service of the Royal College of Surgeons, and was placed in charge of the magnificent natural history collection got together by John Hunter, whose story we read in this work. Owen devoted years and years to classifying and explaining this collection in printed books. He met Cuvier, and carried on in England the work which the Frenchman had begun abroad. Owen rivalled Cuvier in piecing together the life history of an animal or bird of which he had but a single bone. The most famous achievement was with the extinct Dinornis, the giant bird of New Zealand. Someone sent over a leg bone of one of these birds, a fossil bone thirty-four inches in length. From that single bone Owen was able to picture and describe the whole bird.

SIR RICHARD OWEN AND THE SKELETON OF A BIRD
Professor Owen built up this skeleton of a Dinornis, an extinct bird, that no living man had seen, from a single bone sent to him.

Later, more bones of such a bird were discovered in a river-bed in New Zealand, and, when put together, they were found precisely to correspond with the description which Owen had given.

Owen did much for the spread of scientific teaching. King Edward VII. and the Duke of Connaught passed many happy hours listening to his lectures at Buckingham Palace. One day, the Duke of Connaught, who was then quite a little boy, was so delighted that, at the end of the lecture, he secretly followed Sir Richard out into the corridor and, as a reward for the pleasure he had had, played him a tune on a new musical-box which had just been given to him. No wonder that the great scientist thought the royal children were delightful little people. We have seen that Owen was a disciple of Cuvier and of Linnæus, and that these two did not believe that species could vary. Therefore we may know that Owen did not see eye to eye with Charles Robert Darwin, the man who caused the greatest sensation in the world of thought since Newton discovered the law of gravitation. Men had thought, as we have seen, that species could not alter. They thought that for every species there had been a separate creation. They thought that the remotest ancestors of cats had always been cats; that dogs had always been dogs, that wolves and jackals and hyenas, lions, tigers and leopards had, in the past, always been exactly as they are to-day. They thought that all living things had descended from ancestors exactly like themselves, that there had been no

change in animals or plants from the dawn of creation. Darwin is dead and gone, but his work will live for ever, and we may easily see the plan of his teaching from three simple things that he left among the specimens which he collected during his life-long studies.

THREE THINGS LEFT BY DARWIN WHICH EXPLAIN THE PLAN OF HIS TEACHING

First we notice a common Indian jungle fowl. That bird is descended from fowls like itself, but from that family of fowls have come all the multitude of domestic fowls that now exist. Next we have a common blue rock pigeon, which represents the parent stock from which are descended all our pigeons—homers, pouters, fantails, turbits, Jacobins, and the rest. The third is a common wild Chinese chrysanthemum. Wild chrysanthemums like this one are the parents of all the chrysanthemums in the world. And what has happened in regard to poultry, pigeons, and chrysanthemums has happened also in the case of thousands of other species in animal life and plant life. Some specimens differ so much that it is hard to believe they are related.

Who was the man who taught this strange doctrine, and gave such a mass of knowledge to the world? Darwin is that man, and we read a charming story about him in this work. He was born at Shrewsbury, in February, 1809, and was the son of a doctor, who intended him for the Church. But he was a born naturalist, and when there came the chance of going for a five years' scientific cruise round the world in the ship Beagle, he earnestly begged his father's permission to go.

WHAT THE WORLD OWES TO THE SHAPE OF A BOY'S NOSE

His father thought that it would ruin his character to go; it was a mad scheme, he declared. Still, he said, if the young man could find one reasonable man to support him in his desire, then he would give his consent. Darwin found that one man, his uncle, a man in whose judgment the elder Darwin had great faith. The uncle was of opinion that the youth should go, for he had been impressed by the fact of his having a nose of peculiar shape. And, as Darwin used afterwards to say, his whole career depended upon the shape of his nose; and we may add that the world owes to that little peculiarity the vast sum of knowledge which Darwin by this voyage was able to contribute. Upon such trifles do great events turn.

The tour round the world gave the careful and observant Darwin a rare opportunity for observation of all kinds of animal life under all sorts of conditions. We must all read for ourselves his delightful volume on the great voyage. When he came home he married happily, and settled down in a pretty old house at Downe, in Kent. There, year after year, he toiled away, arranging and describing the specimens which he had brought home; there he watched his poultry and pigeons and dogs, his fruit and bees and flowers, and all the time his great mind was slowly working its way toward the light with regard to the wonderful theory which we have been considering.

HOW CHARLES DARWIN & ALFRED RUSSEL WALLACE THOUGHT THE SAME THING

He was a slow worker, for his health was bad, and he was nervous about making a statement which might be challenged. Little by little he was building up his theory, and at various times he had shown some of his written conclusions to Lyell and others. What would have happened otherwise we do not know, but before his greatest book was published a very romantic thing occurred.

Dr. Alfred Russel Wallace, who was at the time exploring and studying in the Malay Archipelago, sent him a paper which he had written, showing that, all unknown to each other, the two men had been working in the same direction. They had both arrived, by separate paths, at the same conclusion. The most startling theory in the modern history of knowledge had come to two men at about the same time. Friends of Darwin to whom he showed Dr. Wallace's paper told him that he must at the same time produce with it his own studies which had been so long in preparation. The two papers were read at the same meeting of the Linnæan Society, and in 1859 Darwin published his masterly work, "The Origin of Species." It created a furious storm of criticism, which raged through England, the

Continent, and America. Darwin's views gained many supporters. Wallace died in England, November 8, 1913, the last of the ten great Victorians, who left their enduring impress upon the science and literature of the age.

THE QUIET OLD GENTLEMAN WHOSE TEACHING STIRRED THE WORLD

But he worked on in the same line, and produced almost as remarkable a book on the descent of man. Other great books dealt with the changes which come over plants and animals under domestication. Another gave us the wonderful history of the soil of the world, and another dealt with the life of the humble worm. Darwin's was a full life and a beautiful one. Everybody loved him; he was so simple and kind and generous and tender. Nobody could have believed that this shy and modest old gentleman could be the great Darwin who had stirred the mind of the whole world, and whom scientists regarded as greater far than kings. When he died, in 1882, the nation mourned, and buried him with noble honours in Westminster Abbey.

Another great teacher of the nineteenth century was Herbert Spencer. His life began at Derby, eleven years after Darwin was born, and ended in 1903, twenty-one years after Darwin's. The two men were each the counter-part of the other. Indeed, Spencer was an evolutionist before Darwin was. Darwin was the great biological specialist; Spencer was the profound philosopher. He began life in a railway engineer's office, and probably would never have been heard of had not a time of disaster come to railways and driven him into journalism in London.

HERBERT SPENCER, THE GREAT THINKER WHO TOOK 40 YEARS TO WRITE A BOOK

His writings were always on the serious things of life, on government and social subjects. He was poor—very poor—and suffered all his long life from severe ill-health—sleeplessness, and all the unspeakable miseries which that misfortune carries. But, in spite of poverty and illness, he set himself to write a whole scheme of philosophy in ten great volumes. He gave himself twenty years in which to do the work. He was then nearly forty, and the work took him forty years to finish.

The books were not such as people would readily buy. They were dry, and hard to read, wonderful as they were as works of learning and reasoning. Three times in those forty years he felt that he would have to close the publication on account of his poverty, but thrice in the nick of time came legacies enabling him to carry it on, and at last the work was finished. By this time his fame was world-wide. He was read with greater interest and devotion abroad than in his own country.

Those brave Russian peasants, of whose valiant struggles for liberty and enlightenment we so often read nowadays, all know their Spencer. The books were taken into Russia and translated, and men would ride forty or fifty miles from village to village with a copy. All the villagers would gather together while someone read the book to them; then a rider would carry the volume on to the next village, so that Herbert Spencer is a name honoured and revered by the poor, down-trodden peasants of Russia, as it is in learned circles in England.

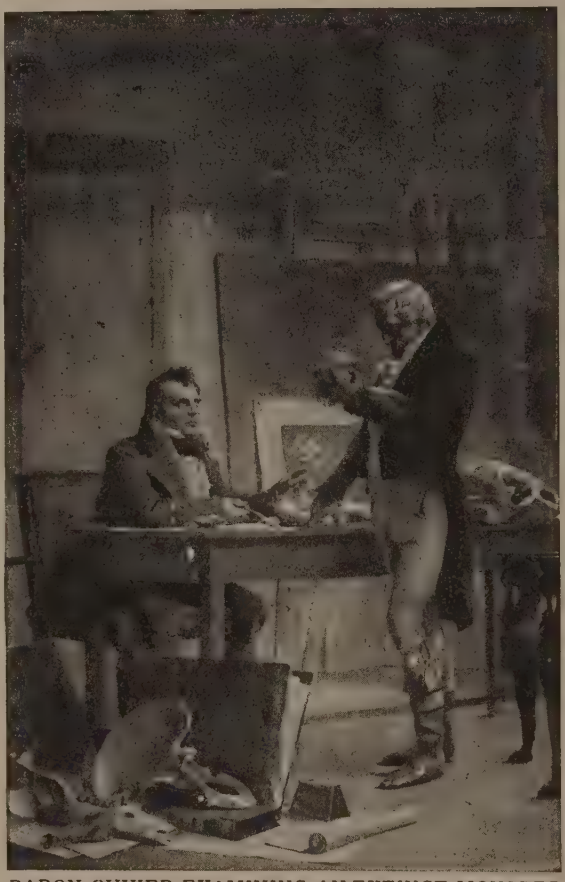
JOHN TYNDALL, THE ENGINEER WHO BECAME A GREAT TEACHER OF SCIENCE

Two other great names stand out, and we must glance briefly at them. First, we have John Tyndall, physicist and philosopher and great teacher. The son of a policeman, he was born in Ireland in August, 1820, and died in Surrey in 1893. Like Spencer, he began life in a railway office, but after a term as tutor in a Hampshire college he saved money, and studied in a German university, and became famous as a scientific investigator and writer. He does not command attention in the way that Spencer and Darwin command it, for, though he made important discoveries in regard to the radiation of heat, about the formation, movement, and action of glaciers, and made valuable contributions to the science of electricity and biology, he was chiefly conspicuous as a great teacher, and as an expounder of the faiths of Darwin and Spencer.

He would have been a notable man for his work in the laboratory, but it was his eloquence upon the platform and his power of saying difficult things in easy language which made him so celebrated. Without Tyndall, Darwinism and Spencerism must have lacked one of their sturdiest supports, and the nation one of its best and most lucid teachers.

Thomas Henry Huxley, with whom we close, was a kindred spirit of Tyndall, but his early days had been more like Darwin's, except in the matter of means. Huxley's parents were not in good circumstances, and the boy, who was born at Ealing in May, 1825, had a rare struggle for a medical education. He wanted to be a mechanical engineer, but had to be a doctor. So a doctor he became, but, like Darwin, found fame on the sea. He had on the Rattlesnake an appointment similar to Darwin's on the Beagle, and, after voyages in two ships, came home with a fine collection of specimens from which he hoped to give the world new light on various points in biology. But he had no money with which to carry out his work, and, in order to get means with which to live, he was on the point of throwing aside his collection and going off again to sea, when, luckily, he was appointed lecturer in the Royal School of Mines. At last he was able to carry on his work and make his influence in science felt.

He had wretched health, but he had the courage of a lion, and worked when other men would have given up the fight. By diligent study he made himself one of the most lucid and attractive writers and speakers in England. He had wit, he had lightning readiness, he had eloquence. Best of all, his soul was in his work, and he spoke not only from the abundance of his splendid brain, but from his heart. His value as a speaker and writer was never more apparent than when Darwin published his "Origin of Species." Critics fell upon it to rend it to pieces, but Huxley was superb, and turned the battle against the enemies of the man who was too shy to appear in public debate to face his fierce critics.



BARON CUVIER EXAMINING AN EXTINCT MONSTER
Cuvier was one of the greatest scientists of modern times and had a marvellous intellect. He was the first to show the close relation of living animals to the extinct monsters of the past, and here we see him at the Sorbonne in Paris examining fossil bones.

Huxley soon became the most famous popular lecturer on science of his day. His lectures attracted crowds, among them working men and the richest people in London. No man had more influence. One day he hailed a cab and bade the driver take him to a hall where he was about to lecture. Arrived at his destination, Huxley offered his fare, but the cabman would not take the money. "No, Mr. Huxley," he said; "your lectures have done me too much good for me to let you pay me my fare. It is an honour to have driven you, sir!" And Huxley, who had not dreamed that the man recognised him, accepted the compliment and passed to his lecture a happy man. Huxley lived for seventy years, and was one of the brightest figures of the nineteenth century, a man of spotless life, and of unselfish devotion to the service of his fellows, and to the great science that he loved and adorned so well.

Continued on page 1007

WHAT THIS STORY TELLS US

WE have read of the wonderful way in which the animals have been changed; how the gigantic animals of the old world passed away, and how the animals we know to-day have taken their place. Those animals that improved themselves, and made their lives fit the world around them, increased and prospered and developed; those that did not adapt themselves to the conditions about them died out. The animals that survived developed better brains than those that died, and mated with other animals of better brains, and the offspring of these had better brains still. Little by little according to the theory of evolution, came new kinds of animals; those that did not improve, that could not keep pace with the changes in the world and the life around them, died out. Here we read of some of the links that still remain to show us how these wonderful changes in Nature were made.

ANIMALS THAT PUZZLE US

CONTINUED FROM 772

WE can still see living animals which form a link between the great animal family of to-day and that family of monstrous reptiles from which they came. These are the greatest puzzles alive. One of them is known as the duck-mole or the duck-billed platypus. When first white men got to know of it, they called it a long name, which meant bird-billed, broad-footed puzzle. With such a name as this, the animal is, as you may suppose, one of the most interesting in the world.

It lives in Australia and Tasmania. It has a body like an otter, but it has a bill or beak like that of a duck. It has webbed feet something like a bird, but in addition to the webbing it has strong claws, which enable it to dig its burrow, twenty or thirty or more feet deep, in the bank of the stream in which it swims and finds its food. It has the body of an otter, the beak and feet of a bird—and it lays eggs! Even that is not the most wonderful thing about it. When the eggs are hatched, the mother platypus pops the little ones into a pouch which it has on the under part of its body, and in that pouch the young ones are fed with milk.

Seeing that the platypus has the beak and feet of a bird, and, like a bird, lays eggs, you will naturally think that it must be some strange sort of a bird which has never learnt to fly. In some respects it is like a bird. Some of its bones are very like those which should be found only in birds. But there the likeness ends, and, taking point by point, we find that the platypus is related not really to the birds, but to the reptiles. Birds were once reptiles; so were nearly all living creatures of the earth and air. Some we can trace back through all sorts of changes, seeing how their forms vary, and how they came only gradually to the shape and size and character with which we are now familiar. But there seems to have been very little change in the platypus.

One feature it has which even a child would know marks it off from the birds and brings it close to the reptiles. All creatures which truly fly have very hot blood. The ordinary animals—horse, dog, lion, and so forth—have warm blood like our own; the blood of the Arctic fox, which lives in the cold, is very hot indeed, five or six degrees hotter than the blood of a man in good health. The seagull, which is always splashing in the cold waves, has blood which is two degrees warmer than ours; while the fast-flying little swallow has blood so hot that it would kill human beings if their temperature were as high. But the platypus, living always in a warm climate, has blood which is little warmer than that of the reptiles.

That at once shows it is allied to the reptiles more than to birds or mammals.

The platypus is from twelve to eighteen inches in length, and has a tail rather like that of the beaver, which is itself four or five inches long. It has thick, dark-brown fur; its ears do not show on the outside of its head, and it has small eyes. The bill is broad and horny, and contains, instead of teeth, hard bony plates. The male platypus has a sharp spur on the heel, but we are not sure what this is for.

THE PLATYPUS CARRIES US BACK TO WHEN REPTILES RULED THE EARTH

If caught on the land, the platypus curls itself up into a ball, like our friend the hedgehog, and it sleeps in this position, with one of its front paws placed across its beak. Its food consists of worms and water insects, which it gets at night out of the rivers and ponds in which it swims. Its home is in a burrow, which it digs by the bank of the river. There, in a rough nest, it makes its home and lays its eggs.

This, then, is one of the most mysterious links with the creation of the old, old days. It carries us back to the time when reptiles ruled the earth, and some men think it establishes a link with the times when there were no real land animals, but only amphibians—that is, animals which passed half their time on the land and half in the water.

The nearest likeness to the platypus is its cousin, the echidna, also Australian, and as wonderful as the platypus, but it has developed in a different way. Instead of fur, it has a covering of quills, like the porcupine. There is hair beneath, but the spines project, and can be made to stand upright when the animal is in danger. It has not a beak like the platypus, but a long, slender, beak-like snout, and no teeth. Its tongue is long and sticky, and is thrust out to catch the ants upon which the echidna lives.

THE LITTLE BEAST THAT BURIES ITSELF WHILE YOU LOOK AT IT

This curious beast has five toes on each foot, like a man or a monkey, but the claws are long and strong, so that the echidna can burrow into the ground with surprising speed. It can bury itself while you watch. Like the platypus, the echidna lays eggs, but it does not leave them in its burrow to be hatched, as its furry cousin does. When the echidna lays an egg it puts it into a pouch which it carries, and keeps it there until the young echidna is hatched. There the baby echidna remains, nourished on the milk which the mother echidna gives it.

So far as the story of Nature can be read from the rocks, animals like the platypus and echidna originated from the beast-like reptiles, even before the birds were changing from other reptiles into creatures with fleshy tails and great teeth. From the creatures which were like the platypus came other mammals. The ant-eaters and porcupines perhap descended from an echidna-like beast. After the birds came the animals which are called marsupials—that is, animals which have pouches upon the underside of their bodies in which to carry their young. Several animals of this type remain to this day. They do not live in England, but in Australia and New Guinea, and in America.

The most famous of the marsupials is the kangaroo. That lives in Australia. The early marsupials reached Australia and New Guinea when those lands had not yet been cut off by the sea from the rest of the world. When the change came there most of them were in Australia, for the numbers in New Guinea are not such as to make them important.

HOW THE KANGAROOS CAME WHEN AUSTRALIA WAS CUT OFF BY THE SEA

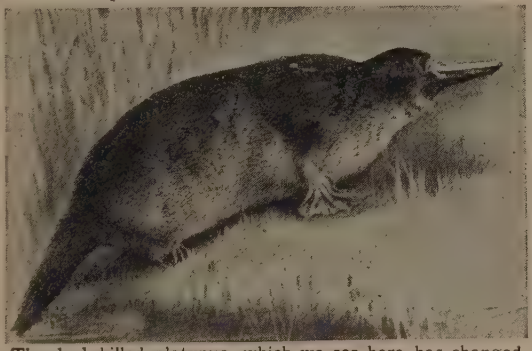
They had the Australian continent to themselves. There were practically no great savage animals to fear. The struggle for life was not fierce as it afterwards became in other lands, where savage beasts could wander from country to country and from continent to continent, unstopped by the sea.

Gradually the marsupial animals of Australia became changed into the forms which we now know. They found that they could live better by leaping instead of running on all fours. Little by little the tail became longer and more powerful, to act as a support to the animal when it sat up. The hind legs grew longer and longer, while the fore legs grew shorter. The tail became not only a support in sitting, but a sort of lever, or third leg, when the animal was travelling. So to-day we have huge kangaroos—not as big as once upon a time they were, but still very large—which, when they stand upon their hind legs, balancing themselves on their tails, are eight feet high.

By the help of their long hind legs and their thick, long tails, they can make wonderful jumps. They do not run, but take flying leaps through the air, carrying them over the level at a wonderful rate, and making them able to leap obstacles which the finest horse could not clear. An ordinary kangaroo can leap a fence nine feet high, but some of them can clear fences which are eleven feet in height. They eat nothing but a diet of herbs, mainly grass.

This is the echidna, which lays eggs and carries them in a pouch till they are hatched. It is supposed that all ant-eaters were once like this.

When they had Australia to themselves they must have lived a happy, careless existence. But now that white men live in the land, with great flocks of sheep and herds of cattle to keep, the poor kangaroo, which has been there from days when perhaps man had not appeared upon the earth in his present form, has to suffer, as all wild animals which eat the food of cattle must suffer. They are hunted without mercy. Men hunt them on horseback, with powerful dogs specially trained for the work. They are shot, or poisoned, or driven into places barricaded so that they shall not escape. Then they are shot down. Their flesh is good to eat, and their hides make valuable leather.



The duck-billed platypus, which we see here, has changed less than any other animal. It has the bill and feet of a bird, and lays eggs, but it has a body like an otter.

The kangaroo, though it would never hurt anybody if it were left alone, fights bravely for its life when thus attacked. The big kangaroo, when chased by dogs, makes for any water that may be near, and stands up in the water. Here it waits for the dogs, and as they come near it forces them down with its fore paws, and holds them under water till they die. If it cannot escape by running, it will turn round and face its enemies.

As a dog approaches, the kangaroo will balance itself on its tail and, striking out with the sharp claws which it has on its hind feet, will tear open the dog which happens to be nearest.

It is very sad when the mother kangaroo is attacked. When her babies are born, tiny, helpless things, she puts them into the pouch which Nature has given her, and there lets them dwell until they are strong enough to run about and join her as she feeds. Sometimes the pretty baby, as the mother bends down to feed, will pop its head out, and, while nestling in the pouch, nibble away at the grass. But even when it grows older, and can come out and crop the herbage, it returns in an instant, if danger threatens, to its mother.

Up come the dogs, into its nest goes the little one, and away the brave mother rushes to save herself and her baby. The weight of the little one makes it hard for her to run; so, when she is tiring and sees the terrible dogs gaining on her, she will force the little kangaroo from its place in the pouch, and leave it on the ground. Then she will dart off in a new direction, so drawing the dogs after her, and leaving her baby safe. If she escapes, she returns by another way and recovers her little one. If she does not escape, she has given her life for that of her babe.

There are kangaroos at nearly all zoos, but there they live in small enclosures. There are some in Lord Rothschild's park at Tring, and in other parks in England, which live in freedom.

One evening one of the Tring kangaroos jumped over the park railings, and went scampering about the roads. A poor man who was tramping along

the roads saw a great figure in the gloom hopping towards him. Thinking that it was an evil spirit, he threw down his pack and ran away shrieking with fear. He never dreamed that kangaroos had been sent from Australia to Hertfordshire, and that this was one of their grown-up children.

THE LITTLE ANIMAL THAT WANDERS ALONG THE SEASHORE AT NIGHT

From the kangaroos that first grew from other forms in Australia many varieties have developed. There is the wallaby, which is smaller than the kangaroo, but in other ways the same. There is a kangaroo which lives in the trees, and is called the tree kangaroo. There is the kangaroo which lives among rocks, and is called the rock kangaroo. There is one so small that we call it the kangaroo rat. The kangaroos owe their existence to the fact that Australia was cut off by the sea from the rest of the world before the flesh-eating animals developed.

Most of the marsupials grew up in the same part of the world. Australia has a marsupial cat-like animal called the dasyure, which has a relation called the Tasmanian devil. The common dasyure, however, is not at all a ferocious monster. It lives on little animals, birds, and insects, and is said to find a good deal of food by wandering along the sea-coast at night.

Then there is a little animal called the Australian bear, or koala. It is not such a bear as you need fear—for it is small, and quite gentle. It carries its young in a pouch like all the rest of these animals, and when they are too old to ride that way, it climbs about the trees with its babies on its back. It lives almost entirely in the trees.

THE STRANGE SLOTH, WHICH SPENDS ITS LIFE LOOKING UP AT THE SKY

The koala is interesting because it is an animal that has grown different from the kangaroos, by walking instead of hopping. It seems a half-way step between the old, old animals of Australia and the bears and sloths of the newer creation. Though it has claws like those of the true bear, it sometimes hangs with its feet holding the bough, and with its back downwards.

That is what the strange animal called the sloth does. The ordinary sloth is about two feet in length, with very strong claws. It spends its life looking up at the sky, which it sees through the branches of the trees to which it holds. Clinging to the boughs on which it feeds, it hangs back downwards, and goes from tree to tree. If by any chance it has to come down and walk upon the ground, it has the greatest difficulty in making its way, for its feet and claws are not adapted to such work. Through living so much among the trees, the sloth has become the colour of the boughs among which it moves, and is very difficult to find.

The two-toed sloth lives in the West Indies, but there is one in South America which has three toes to each foot. This one is called the ai. The young of the sloth are carried about by their mother. They cling to her fur and ride securely as she climbs along the trees. The sloth has no pouch.

THE CUSCUS, WHICH HANGS ON A TREE BY ITS TAIL, AS IF DEAD

Now let us look at another tree-loving animal which has a pouch. This is the cuscus, an animal about the size of the cat, which lives in New Guinea and the Molucca Islands, and elsewhere, but not in Australia. The head and body are about eighteen inches long, but the tail is nearly as long as the head and body. This tail is a wonderful feature of the cuscus. Bare, except at the root, this tail is as good as an extra hand or foot to the cuscus. It winds round and clings to any branch or other object, and gives the animal a sure hold while it is seeking its prey. Should the animal believe itself to be in danger, it trusts everything to its tail.

It winds its tail round a bough, then, swinging downwards, hangs there, pretending to be dead. If we saw an animal hanging head downwards from the bough of a tree, we should quickly make a closer examination. But the cuscus has fur which looks just like the dry leaves of the trees in which it lives. Of course, it is larger than the leaves, but as the colour is much the same as theirs it cannot be distinguished. If its form be noticed, any but an experienced hunter might think the living animal to be some big fruit hanging dead upon the branch.

This trick of pretending to be dead must save the cuscus from many a danger. There are other creatures which employ the same art. Birds and

ANIMALS WHICH CARRY THEIR BABIES IN POCKETS

Here is a small kind of kangaroo which lives and feeds in the trees. It is one of Australia's animals.

The wallaby, of which this is a photograph, is a pouched animal like the kangaroo, only it is smaller.

This is a kangaroo, which carries its babies in a pouch on the under-side of its body. It does not run, but hops and springs, with its hind legs and great tail. Because it eats grass which sheep and cattle need, the poor kangaroo is mercilessly hunted and killed. When attacked by dogs it will fight very fiercely.

This is a wombat, another animal which carries its babies in a pouch. It looks like a small bear.

Here is an opossum, the great pretender. If attacked it lies quite still and pretends to be dead.

The photographs in these pages are by Lewis Medland, W. P. Dando, Chas. Reid, and others.

spiders are among the number. But the most striking example of all is the opossum. This is another of the animals which carries its little ones in a pouch. Perhaps you have heard people talk of "playing possum." The saying is a colloquial one for pretending. The opossum, who lives in the south. is a terribly hungry animal. It eats all sorts of vegetation, and, not satisfied with these, some kinds destroy large numbers of rabbits and poultry, and devour the farmer's fruits and grain. You will not be surprised, then, to learn that it is mercilessly hunted.

THE WONDERFUL OPOSSUM, WHICH BEARS PAIN THAT NO MAN COULD BEAR

Now, so long as it is in the trees the opossum is safe. It can hide, and it can cling with its wonderful monkey-like claws, and its clinging, twining tail. The tail is one of Nature's masterpieces. It is so strong and holds so surely that when the opossum is in a fruit-tree it can hang head downwards, and, holding only by the tail, can eat while in this position. Well, so long as it is in the trees, the opossum is fairly safe. But sometimes it is overtaken while on the ground. It cannot run very quickly, and dogs and men can come up with it. The animal then stretches itself out on the ground and pretends to be dead. You may beat it, you may throw water on it; you may do everything but actually kill it, and it will lie as still as a carved figure. Then, when you have done your worst, and have left it on the ground for dead, the little pretender will jump up and scuttle off home.

This is a wonderful thing. To hang as the cuscus hangs shows great cunning, but to lie and bear all the pain which the opossum bears at such a time is something no human being could do.

THE BABY OPOSSUM THAT HUNTS THE CRABS, AND THE INQUISITIVE RACOON

The common opossum is about twenty-two inches long; its remarkable tail is another fifteen inches in length, and scaly, to enable it to grip the branches. But there is a tiny opossum, only six inches long, though the tail itself is seven inches in length. This one is curious for two reasons. It has not the true pouch for its babies' cradle as the kangaroos and other opossums have. It has a fold of skin, but not enough for the purpose. So the mother opossum puts its babies on its back. They cling to her fur with their sharp little claws, then, when she curls her tail up over her back, they curl theirs up, too, and cling with theirs to hers. Then away they go, pick-a-back, through the trees and woods, and down to the seashore and salt marshes, where the crabs are. Another little animal that eats crabs is the joker of our American forests, the racoon—the coon, as southern people call it. Caught young, the racoon makes a splendid pet. It is a most inquisitive animal, when tamed, and observes everything its master has.

When wild, it is a very different creature—shy, active, and a busy catcher of oysters and crabs and other shell-fish which it finds upon the seashore. Experience has taught it how to get the flesh of the crab from the shell without itself receiving a nip from the crab's strong claws. A curious habit of the racoon is to dip its food in water and wash it before eating, pretending to do so when it has no water, in a very amusing way.

THE WOMBAT THAT GOES OUT BY NIGHT, AND THE RAT AS BIG AS A BOY

Two more of Australia's curious animals remain to be noticed. One is the bandicoot, and the other is the wombat. The bandicoot stands, perhaps, half-way between the kangaroo and the Tasmanian devil. It has a pouch for the young ones and cradle; it has teeth like a savage animal, and hind feet resembling a kangaroo's. It likes insects and worms, but it is also too fond of crops and roots for men to regard it as a friend. It is about eighteen inches long. There is a bandicoot rat, the biggest of all rats, but that lives in India, and is not a bandicoot at all. It is a great rat, which weighs from two to three pounds, and measures thirty inches in length.

The wombat is a sturdy, pouched animal, with powerful teeth and claws, which lives in its underground burrow all day long, and comes out to feed on grass and roots by night. It has the gnawing teeth of the rodent, but with its shuffling walk and the build of its limbs and body it resembles a small bear. The biggest living wombat measures about a yard from its snout to its tiny tail, but in the old days there were wombats as big as the rhinoceros.

THE NEXT NATURE STORIES ARE ON PAGE 995.

SIX STRANGE ANIMAL LINKS WITH THE OLD WORLD

The Tasmanian wolf, which we see here, is a very fierce animal, which lives only in Tasmania. Like the kangaroo, it carries its young in a pouch, and this shows that it is not a true wolf.

This is a bandicoot, which is a link between the kangaroo and the Tasmanian devil. It eats herb-food and flesh and insects.

This is a very savage little animal called the Tasmanian devil. With its fierce courage and terrible teeth it is too much for any dog.

This is a racoon, one of our animals which lives in trees, but at night likes to go fishing for oysters and crabs. It makes a nice pet, but has a great temper.

This is the pretty little dasyure, which is not a savage beast like the Tasmanian devil. It lives mainly on fish and small animals.

Here is a sloth, a strange animal which lives upside down, hanging from trees, but can climb rapidly. Once there were giant sloths, as we have seen on page 50. This is a three-toed sloth.

KING ARTHUR RESTING AT THE COURT OF THE TABLE ROUND

From the painting by Sir E. Burne-Jones; photograph by Frederick Hollyer.

THE STORY OF THE TABLE ROUND

ONE day as Caxton, the inventor of printing, sat by his press in Westminster Abbey, there came to him certain noble gentlemen asking how it was he did not print in a book the famous stories of King Arthur and his Round Table. It seemed to these good men that, after the Bible, the legend of Arthur should be the first book printed, since that legend told the stories of England's earliest days and her greatest King. Glad are we that Caxton listened to this request, for by his book we now know the beautiful and mystic legend. These stories have been told to children, and been the delight of all for centuries. They are England's share in the world's literature of Chivalry. The story is told here of the beginning of the Table Round and some of the deeds of Arthur's knights, and at another time we shall read further tales from this wonderful store.

KING ARTHUR AND HIS KNIGHTS

THE COMING OF THE KING

CONTINUED FROM 820

ON a bright, crisp spring morning in Eastertide, some years after the Romans had withdrawn from Britain, there rode towards Westminster, on the banks of the Thames, a pleasing trinity of horsemen—an old, cheerful-faced knight named Sir Hector; his handsome young son, Sir Kay, only just dubbed a knight; and a beautiful fair-haired youth of a most noble and kingly bearing, who, nevertheless, seemed more to desire the good fortune and happiness of the other two than to consider himself.

As they rode merrily forward, a sudden vexation overspread the face of Sir Kay, and he reined in his horse, exclaiming, with all the annoyance of youth, "I have left my sword behind me!" Sir Hector laughed with a loud delight, for here was a young man riding to a tournament, who had thought most carefully of his little moustaches, his fine apparel, his spurs, and the accoutrements of his horse, but had forgotten his sword! Sir Kay, though he laughed, flushed under his father's banter, and he was glad when the noble youth at his side turned the current of laughter by announcing his intention of riding back to get the sword for Sir Kay.

Back rode this handsome youth, whose name was Arthur, glad to do a service for his friend; but, on coming to the house, he found it locked and silent, for every one of the attendants had pressed forward to the famous tournament at Westminster. Arthur's brows clouded as he looked at the silent walls and the closed windows. What would his friend do at the tournament without a sword? What misery for him! What vexation! Never would Sir Kay hear an end of Sir Hector's banter.

As he mused in this manner it came to his mind that there was, in a field by Westminster, some extraordinary sword stuck so fast in an anvil that no man could move it. Stories had reached his ears about this sword ever since Christmastide—strange stories. Some even said that he who could draw the sword would be chosen rightful King of Britain. Arthur thought that, whether these stories were true or not, he would at least try to get the sword for his friend and half-brother, the bold, handsome Sir Kay.

As soon as this thought occurred to him he rode forward and came to the anvil, which was set in a stone, and, climbing thereon, lifted the sword easily from its cleft. He must have thought the story was an idle jest. For there stood the large anvil in the field, the Thames flowing by in the distance, and nowhere that his eyes looked could he see any man guarding the sword. It was evidently set there for a jest, and the ease with which it came from the anvil convinced him that the story, at least in its meaning, had been exaggerated. Cheerfully he rode forward and overtook Sir Hector and his son.

But Sir Kay, taking the sword with a bright word of thanks, turned it over, and his face became deadly white, and he questioned Arthur how he came by it. Arthur told him.

"Then am I," cried Sir Kay, with a loud voice, turning quickly to his old father, "King of Britain?"

Sir Hector grew very solemn, and demanded of his son how he came by that sword. Sir Kay told him. Then the old knight, raising his eyes to the boy Arthur, dismounted from his horse, and, bending his knee at Arthur's stirrup-leather, said, "Sir, I perceive that thou art my King, and here I tender thee my homage."

Sir Kay did likewise.

Then they rode to tell the Archbishop all that had happened. Strange must it have seemed to Arthur, who had taken the sword to do another a kindness, that this simple little act of friendship and love had made him King of Britain. But Arthur did not know the story of his birth. All he knew was this—that he had grown up side by side with Sir Kay under the roof of the brave Sir Hector, that they had been like brothers together, and that always Sir Hector had treated him with love, and yet withal a certain restraint, as though to do him reverence.

How the boy Arthur came to live in the house of Sir Hector may be briefly told. The father of Arthur was one Uther Pendragon, King of Britain, and this King loved a lady who cared not for him, and would not be his wife. There came to him Merlin the Wizard, who said to the King, "Grieve not, Pendragon, for I will give this lady to you; but first swear to me by your honour that the son which shall first be born to you you will give to me." The King promised. Then Merlin gave to the King a change of aspect which pleased the disdainful lady, and she became his Queen. And when the son was born, named Arthur, the King gave him to Merlin, and the Wizard took the child and carried him to Sir Hector, and bade the good knight bring up the child with the little Kay.

Now, why did the wise Merlin do this? Because he knew the trouble that was coming. Uther Pendragon died, and immediately there was rebellion and riot in the land, the nobles fighting against each other, and in their pride trampling down the crops of the peasants and slaying so many good men that the whole kingdom was brought to waste and ruin. The little Arthur would certainly have been killed had he been found on the Queen's knee. But Merlin waited, and when Arthur was grown to man's estate, and was kingly enough to take and keep his kingdom, then Merlin went to the Archbishop and bade him call to Westminster at Christmastide all the barons and knights of that realm, that they might pray Heaven for peace and deliverance from ruin, and there should be seen a great marvel.

And it came to pass when the great nobles came forth from the Abbey on Christmas Day that they beheld an anvil set on a stone, and in the anvil, as though a giant's stroke had cleft it there, a sword strong and mighty; and they approached and saw written on the stone:

"Whoso can draw forth this sword is rightful King of Britain born."

All the barons rushed greedily to wrench out the sword, but each man failed, and was astonished and angered. Then said the Archbishop that there should be held a great tournament at Eastertide, and then, once again, the barons and knights should tug at the sword for the crown of Britain.

Imagine the surprise and indignation of the great, fierce barons when they learned at Eastertide from the Archbishop how that Arthur had drawn the sword easily, no man seeing him, and that he was rightful King of Britain. They roared their dissatisfaction. "Let

us see it done with our own eyes," they said. "If he pulled it out, let him press it back and do it again."

So they all rode back to the anvil set on a stone, and he who had ridden so humbly to the tournament, almost as the squire of Sir Kay, now found himself the centre of a dense mass of men, all their eyes gazing upon him.

The spring sunshine fell upon his fair hair, and the people, seeing him on the stone—young, beautiful, and strong, with the sword in his hand and his eyes bent upon them—felt a strange stir in their blood. And they were glad, so glad that their cries of "Arthur is King!" rent the air when he forced back the sword and drew it forth again as if it were a withy from the stream.

Yet were the barons not satisfied. "What this boy can do a man can do," they argued. And the sword was put back, and one by one the barons wrenched at it, but in vain.

Then at last they acknowledged Arthur as their King, and the Archbishop set the crown upon the fair head of the young man, and the people filled those happy Easter skies with their shouting, for the face of Arthur was like a blessing, and from his eyes there seemed to fall a healing peace upon the wounded land.

THE FOUNDING OF THE KINGDOM

The Coming of the Queen and the Making of the Round Table

SCARCELY had Arthur promised peace to his land, when a number of Kings, who swore they would never acknowledge this magic-chosen monarch as a rightful King, linked their forces and came up against Arthur in battle. So Arthur, who longed to give his people peace, was obliged to fight, and two good Kings of Gaul, Ban and Bors, came to his aid, and he fought with his enemies and overthrew them in a mighty battle. But now, once again, he was unable to devote his days to peace, for Ban and Bors begged him to bring his army to their rescue in Gaul, where they themselves were threatened by enemies. So Arthur went with his allies and fought with them. Glad was he, indeed, when the war was over, and he returned to his own land.

But what a kingdom it was! War had trampled it into the likeness of a wilderness: the forest had spread itself out and conquered the tilled fields; weeds, rank and gross, grew in the gardens; the huts of the peasants were in ruins; and, worst of all, misery had so worked in the hearts of the people that they had turned against God and were living fierce, evil, and barbarous lives. In those days the woods were full of robbers. Ladies dare not walk beyond the end of the street. Murder lurked behind every bush. Every man's hand was against his brother, and every man considered not the welfare of others. but his own.

Arthur looked with sorrow on this degraded land, but not with despair. He knew that there is in all men good, to which a good man may always safely appeal. So he proclaimed a reign of justice and love; and he cut broad roads through the dense forests, and he called upon the strong to protect the weak, and bade every man who called him King to honour women and little children. The peasants rejoiced in these commands, and the land once more began to smile under the hand of husbandry; but still there were many who loved violence for its own sake, and others who robbed and murdered because they hated to work.

At this time Arthur fell in love with the most beautiful princess in the world. Guinevere, only daughter of King Leodegran, who reigned in Cameliard. He told Merlin the Wizard of his great yearning for this exquisite lady, and Merlin was sad. Arthur questioned him of his sadness, but Merlin said sorrowfully that it was in vain to try and turn the tide of a man's passion; Arthur must have his way, yet must evil needs come out of this marriage.

Arthur was too hot in love, and too flushed with the joy of his young kingship, to listen to these twilight warnings of the old man. Very joyfully he rode out to meet the lovely Guinevere, and at Canterbury, where the marriage was to take place, he made a great feast, and there he set up what is called the Round Table, and called to it all valiant and gentle men who would stand round their King and protect the weak and punish the tyrant. And chief among those at the King's side was the peerless knight, Sir Lancelot of the Lake, who had brought Guinevere to the King.

And this is the history of the Round Table. Merlin made it for Uther Pendragon, and at the death of Uther Pendragon it passed to King Leodegran, who held it in high esteem. But when Guinevere, his daughter, rode forth with Sir Lancelot of the Lake to marry Arthur at Canterbury, Leodegran sent to the young King this huge table which had once been his father's, as the next best gift he could give after Guinevere, his lovely daughter. And so Uther Pendragon's table became Arthur's table.

Now, at the marriage feast, when Arthur called brave men to his table, it was no mere act of amusement. With high pomp and gorgeous ceremony he called his knights. He made them as knights servants of Christ the King.

He bade them consider themselves as the soldiers of the Perfect Christ; and he explained to them his high and noble purpose, which was to rule Britain by his order of chivalry, by the Knights of his Round Table. They were to go forth, armed and vigilant; they were to ride up and down in the land, punishing tyrants and evil men, helping the poor and needy, succouring the weak and defenceless, and turning the hearts of all men to Christ and the King.

Thus, in the good providence of God, Britain should have peace, and the blessings of Heaven light upon the lovely isle for ever.

We wonder what the gracious and lovely Queen thought of King Arthur as he spoke to his knights, and as they one by one came and knelt before him. She must have admired his beauty; she must have felt the magic in his words; she must have seen the power in his soul; but did she feel love for him? Alas, this lovely Queen, smiling at Canterbury upon the first act of the King's chivalry, was to be its ruin and disgrace. The dream of the great King was to be shattered by the beauty of the Queen.

Perhaps at that grand ceremony Merlin did not look either at the King or at his kneeling knights, but only at the Queen. Did their eyes meet, we wonder—the young Queen's and the old prophet's? And if so, did Guinevere flush and look aside, avoiding the eyes both of Merlin and Sir Lancelot?

THE CHALLENGE OF THE KING

And the Fight with Sir Pellimore in the Forest

So gay and cheerful was King Arthur that he would often ride out alone and unkingly into the forest, seeking an adventure after the manner of his knights, who went about redressing wrong.

And it chanced one day, as he rode in the forest Perilous, that he encountered a wicked knight who for the mere joy of fighting mounted guard over the path, permitting no man to go past. This wicked Sir Pellimore challenged the knight approaching him, and Arthur gave him battle, veiling his kinghood. The two horses crashed together, and both horsemen came to the ground. Sir Pellimore was mighty above every man at that time, and he splintered the King's shield and broke his sword. But Arthur rushed at him, and, seizing him about the middle, hurled him to the ground. Yet did Sir Pellimore

cling to him, and would have done him some harm if Merlin had not come and thrown him into a deep sleep. When he aroused and knew that he had fought with the King, Sir Pellimore was sore afraid. But Arthur forgave him, and accepted him as a Knight of the Round Table, so that Sir Pellimore forsook his evil ways and fought only for the honour of Christ and the King.

The King went on with Merlin, and they came to a deep lake in the midst of the forest. And Merlin stayed the King, and they went to the edge of the water and looked across it. And as they looked a wondrous arm came from the centre of the lake, and in the hand was clasped a sword. Then Arthur saw a little boat by the lake, and Merlin bade him enter it, and go out upon the water and take the sword. So Arthur did as the wizard told him, and returned with the sword.

Then Merlin pronounced its name "Excalibur," and told Arthur that it was the mightiest sword on earth, and that upon the hilt was engraved on one side, "Keep me," and on the other, "Throw me away." He bade Arthur keep it carefully, for the time was not yet when he should throw it away.

And this sword, in the hand of the King, became the mightiest in Christendom, and its fame has lasted unto this day.

No man could stand before Excalibur, and the glory of the King increased. Yet never once used he Excalibur in an evil cause, nor encouraged the Brotherhood of his knights to love fighting save for noble ends.

And his knights were like, as it were, his apostles; they took from him the glory of his soul, and carried chivalry into all the length and breadth of Britain, so that there was no land so honoured and so happy as Britain, and no knights in all Christendom so famous for pure lives, great valour, and exceeding courtesy as King Arthur's Knights of the Round Table. Gloriously in those days did the sun shine upon the green fields and waters of Britain.

THE VISION OF SIR GALAHAD

And How the Youngest of the Knights Found the Holy Grail

Now, the knights of King Arthur had each one his own seat at the Round Table, and on every seat the name of the knight was carved.

But there was one seat called the Perilous, which had no occupant, none daring to sit in it, and over the name, which no man knew, there was always a covering.

One day, as the King and his knights sat together, there entered the great hall an aged knight, followed by a most beautiful young man. The old knight advanced to the seat called Perilous, and pointed to the young man that he should sit there. When his command was obeyed, the old man bent over the youth, kissed him, and departed.

Much amazed was the King, and asked the young man his name.

"I am called Galahad," said he.

Then the King raised the cloth on the seat, and lo! the name written there was "Galahad."

Now, Galahad was the youngest of the knights, and not so strong a man as the others; but there was such majesty in his eye, such purity in his brow, and such sweetness on his lips, that the others felt for him a great reverence, and he was treated even by the King with high honour.

One evening, as the knights sat together, the King being absent, a good and happy young knight, named Sir Percivale, entered the hall with a wonderful story.

He had been to see his sister, who was a nun, and this sister had told him how one night, as she lay sleeping in her cell, she was suddenly awakened by most sweet music, and, opening her eyes, saw a broad shaft of moonlight streaming through her window, in the midst of which floated and throbbed like a beating heart the sacred chalice out of which our Saviour drank the wine at the Last Supper—the sacred cup, called by all men the Holy Grail.

The knights started up at the tale. This Holy Grail, so ran the legend, had been brought to England by that good Joseph of Arimathea, who laid our Saviour in the sepulchre from which He rose triumphant on the earth's first Easter Day.

KING ARTHUR
He rode a simple knight among his knights,
And many of these in richer arms than he.

The Holy Grail had once been venerated in England, but suddenly it had vanished—some said because of the evil in the land—and, after searching for it up and down the kingdom for a long time, men at last had ceased to think about it. But now the vision had appeared again.

Among the knights to whom Sir Percivale's story came with great power was Sir Galahad. His face declared how deeply he was moved. Sir Percivale, looking upon him, saw that the expression in Sir Galahad's eyes was like that which he had seen in the eyes of his sister, and it came to him that Sir Galahad should go and see the nun, and speak to her about the Holy Grail. If man was to find the Cup, it would be this pure and noble youth.

So Sir Percivale took Galahad to the place where his sister lived, and as soon as the nun saw Galahad she knew that he was to be Knight of the Holy Grail. Then the beautiful nun cut from her head all the lovely hair that adorned it, and made a girdle of these gleaming tresses, and bound it about Sir Galahad's waist, and fastened his sword to it, and charged him with the holy mission. He was to pray often; he was to go forth doing good, and, after the vision of the Holy Grail was vouchsafed to him, he was to journey to a far-off city where the people would crown him King.

Sir Galahad obeyed the nun. He was not the only knight who went forth in quest of the Holy Grail, for the story of the nun had fired the imagination

of all the knights at King Arthur's Court, and Britain now witnessed the dispersal of these brave men in quest of the sacred Grail. But Galahad was the only knight whose heart was pure, and it was to Galahad that the vision came.

On his long journey he fell in with his old friend Sir Percivale, and Sir Percivale confessed that not yet, in spite of fastings and prayer, had he seen the blessed vision. Then Galahad told Percivale how the vision was always before him, and how it had led him from victory to victory, and how no man could stand against his spear.

"But you, too, shall see the vision," he concluded, "for I am about to go to a far city, and at the moment of my departure you shall see the Holy Grail."

The two knights travelled forward on their horses. Sir Galahad carried on his left arm a white shield with a scarlet cross, and his great war-horse, with its crisping mane and long, flowing tail, was as white as milk. They rode silently, as men engaged upon some absorbing quest. Sir Galahad's eyes gazed straight before him, with a strange light in them. Sir Percivale glanced often at Sir Galahad. He was like a man who had looked upon the face of Christ.

Towards nightfall they reached the wide-stretching marshes, and heard in the far distance the roll of the surf. As they urged their horses into the gloom overhanging the marshes, they saw rising up before them, and stretching forward on pier after pier to the well-nigh invincible ocean, a vast and

Painted by G. F. Watts, R.A. Photograph by Fredk. Hollyer.

SIR GALAHAD

His strength was as the strength of ten,
Because his heart was pure.

towering bridge. Sir Galahad's eyes lighted at sight of this bridge, a smile illumined his pale face, and with one bound he was upon the bridge, and clattering upward and forward.

Sir Percivale reined in his horse. He dared not follow. For as Sir Galahad reached the first pier it sent up into the night-sky a tongue of scarlet flame, and the second pier did the same, and the third, till the whole bridge over which Sir Galahad had passed was a great, sweeping mass of fire. But Sir Percivale, waiting in the darkness on his startled horse, had his reward. Just as Galahad reached the sea, the whole sky was filled with the anthem of heaven, a mighty city of pearl-white towers and pinnacles disclosed itself above the ocean. And over this city into which Sir Galahad was entering, swimming in a mist of everlasting beauty, appeared the Holy Grail.

Sir Percivale bowed his head upon his breast, and in that moment, so sacred, so wonderful that no language can describe it, vowed his life to the service of God and the love of Christ.

THE GOLDEN BIRD IN THE KING'S GARDEN

A certain King had a beautiful garden, and in it stood a tree which bore golden apples. About the time when the apples grew ripe, it was found that every night one of them was gone.

The King became very angry at this, and ordered the gardener to watch all night. The gardener set his eldest son to watch; but about twelve o'clock he fell asleep, and in the morning another of the apples was missing. Then the second son was ordered to watch; and at midnight he, too, fell asleep, and in the morning another apple was gone.

Then the third son lay down under the tree to watch. As the clock struck twelve a bird of pure gold came, and as it was snapping at one of the apples the gardener's son shot an arrow at it. But the arrow did the bird no harm; only it dropped a golden feather from its tail, and then flew away.

The golden feather was brought to the King in the morning. Everyone agreed that it was worth more than all the wealth of the kingdom; but the King said, "One feather is of no use to me; I must have the whole bird."

Then the gardener's eldest son set out to find the golden bird, and when he had gone a little way he came to a wood, and he saw a fox, and was going to shoot it. But the fox said:

"Do not shoot me, for I will give you good advice. I know that you want to find the golden bird. You will reach a village, and you will see two inns opposite to each other, one of which is very beautiful to look at. Do not go in there, but rest for the night in the other."

But the son took no notice of the fox, and when he came to the village he went into the smart house, and ate and drank, and forgot about the bird. Time passed on, and, as the eldest son did not come back, the second son set out, and the same thing happened to him.

The youngest son then went to seek the golden bird. As he came to the wood he met the fox, and heard the same good advice. But he was thankful to the fox, and did not try to shoot him, and so the fox said, "Sit upon my tail, and you will travel faster."

So he sat down, and the fox began to run, and away they went, so fast that their hair whistled in the wind.

When they came to the village, the son went to the shabby inn, and stayed there all night. In the morning the fox came again and said:

"Go straight forward till you come to a castle, before which lie a whole troop of soldiers fast asleep. Take no notice of them, but go into the castle and pass on till you come to a room where the golden bird sits in a wooden cage. Close by it stands a beautiful golden cage; but do not try to take the bird out of the shabby cage and put it into the handsome one."

Then the fox stretched out his tail again, and away they went.

Before the castle gate all was as the fox had said. So the son went in and found the chamber where the golden bird hung in a wooden cage, and below stood the golden cage, and the three golden apples that had been lost were lying close by it. Then he thought:

"It will be an odd thing to bring away such a fine bird in this shabby cage."

So he took hold of it, and put it into the golden cage. But the bird set up such a loud scream that the soldiers awoke, and took him prisoner. The next

THE YOUNG MAN RODE ON THROUGH THE WOOD WITH THE PRINCESS AND THE GOLDEN BIRD

morning the Court sentenced him to die, unless he should bring the King the golden horse which could run as swiftly as the wind. If he did this, he was to have the golden bird for his own.

So he set out once more on his journey, when the fox met him and said:

"You see now what has happened through not listening to my advice. I will, however, tell you how to find the golden horse. You must go straight on till you come to a castle where the horse stands in his stall. By his side will lie the groom fast asleep. Take away the horse quietly, but be sure to put the old leathern saddle upon him, and not the golden one close by it."

Then the son sat down on the fox's tail, and away they went. All went right, and the groom lay snoring with his hand upon the golden saddle. But when the son looked at the horse, he thought it a great pity to put the leathern saddle upon it.

"I will give him the good one," said he. "I am sure he deserves it."

As he took up the golden saddle the groom awoke, and called out so loudly

that all the guards ran in and took the young man prisoner, and in the morning he was again brought before the Court and sentenced to die. But it was agreed that if he could bring thither the beautiful Princess he should live, and have the bird and the horse given him.

Then he went on his way again very sadly; but the old fox came and said: "Why did you not listen to me? But I will once more give you advice. Go straight on, and in the evening you will arrive at a castle. At twelve o'clock at night the Princess goes to the bath-room; go up to her and give her a kiss, and she will let you lead her away; but do not allow her to take leave of her father."

As they came to the castle, all was as the fox had said, and at twelve o'clock the young man met the Princess, and gave her a kiss, and she agreed to run away with him, but begged with many tears that he would let her take leave of her father. At first he refused, but at last he consented; but the moment she came to her father's house the guards awoke, and took him prisoner.

Then he was brought before the King, who said, "You shall never have my daughter unless in eight days you dig away the hill in front of my window."

Now, this hill was so big that no one could take it away; but when he had worked seven days, and had done very little, the fox came, and said:

"Lie down and go to sleep, and I will work for you."

In the morning the hill was gone.

Then the King was obliged to keep his word, and away went the young man and the Princess; but the fox came and said to him:

"We will have all three—the Princess, the horse, and the bird. When you come to the King, and he asks for the beautiful Princess, you must say, 'Here she is!' Then you will mount the golden horse that they are to give you, and put out your hand to take leave of them; but shake hands with the Princess last. Then lift her quickly on to the horse and gallop away."

All went right, and then the fox said: "When you come to the castle where the bird is, I will stay with the Princess at the door, and you will ride in and speak to the King. When he sees that it is the right horse, he will bring out the bird; but you must sit still, and say that you want to look at it; and when you get it ride away."

This, too, happened as the fox said; they carried off the bird, the Princess mounted again, and they rode on to a wood. Then the fox came and said:

"Beware of two things: don't ransom anyone from the gallows, and do not sit down by the side of any river." Then away he went. The young man rode on with the Princess, till at last he came to the village where he had left his two brothers. And there he heard a great noise; and when he asked what was the matter, the people said:

"Two men are going to be hanged."

As he came nearer, he saw that the two men were his brothers, who had turned robbers; so he said:

"Cannot they in any way be saved?"

But the people said "No," unless he would give all his money to buy their liberty. This he did, and they all went on till they came to the wood where the fox first met them. Here it was so cool and pleasant that they all sat down by the side of the river. Then the brothers came behind and threw him down the bank, and took the Princess, the horse, and the bird, and went to the King, saying, "We have won all this by our labour."

Then there was great rejoicing; but the horse would not eat, the bird would not sing, and the Princess wept.

The youngest son fell to the bottom of the river's bed. Luckily it was nearly dry, but the bank was so steep that he could not get out. Then the old fox came once more, and scolded him.

"Yet," said he, "I cannot leave you, so lay hold of my tail and hold fast."

Then he pulled him out and said:

"Your brothers are going to kill you if they find you in the kingdom."

So he dressed himself as a poor man, and came secretly to the King's Court, and when he came in the horse began to eat, and the bird sang, and the Princess left off weeping.

He told the King of his brothers' evil deeds, and they were punished; and when the King died the youngest son and the Princess ruled the kingdom.

A long while afterwards he met the old fox, who begged him with tears in his eyes to kill him. At last he did so, and in a moment the fox changed into the long-lost brother of the Princess.

THE FABLES OF ÆSOP THE SLAVE

THE WOLF AND THE CRANE

A WOLF, when eating his dinner one day, swallowed a bone, which stuck in his throat. He went howling about, asking every animal he met to help him, and promised a large reward to anyone who could get the bone out. At last a crane, who had a long, slender neck and bill, undertook the task.

Poking his long bill down the wolf's throat, he got hold of the bone and pulled it out; but when he asked for his reward, the wolf laughed and said, "You may think yourself lucky that

I did not bite your head off when it was in my mouth."

Some people are not grateful when anyone does them a kindness.

THE PROUD FROG

AN OX, grazing in a field, happened to put his foot down among a family of young frogs, and trod one of them to death. The others told their mother what had happened, and said that the animal that did it was the biggest creature they had ever seen.

"Was it as big as this?" said the old frog, swelling herself out in the curious way that frogs can do.

"Oh, much bigger than that!" said the little frogs.

"As big as this?" she asked, straining herself still more.

"Indeed, mother," they said, "you would never be so big if you were to stretch till you burst."

Then the foolish old frog made

another effort to make herself still bigger, and she burst and died.

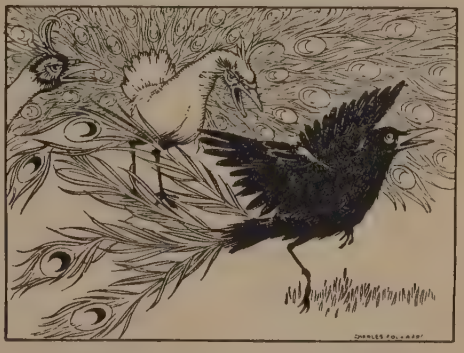
Never try to make yourself out to be a more important person than you are.

THE VAIN JACKDAW

A CERTAIN jackdaw was so vain and conceited that he was not contented with his plain black feathers. So he picked up a quantity of beautiful feathers that had fallen from some peacock's trains, and fastened them carefully on his own back.

Then he tried to join the family of peacocks, as if he was one of themselves; but they soon found him out, and pecked him so hard that he was glad to run away.

He then went back to his old friends, the jackdaws; but they drove him away, and would not be friends with him any more.

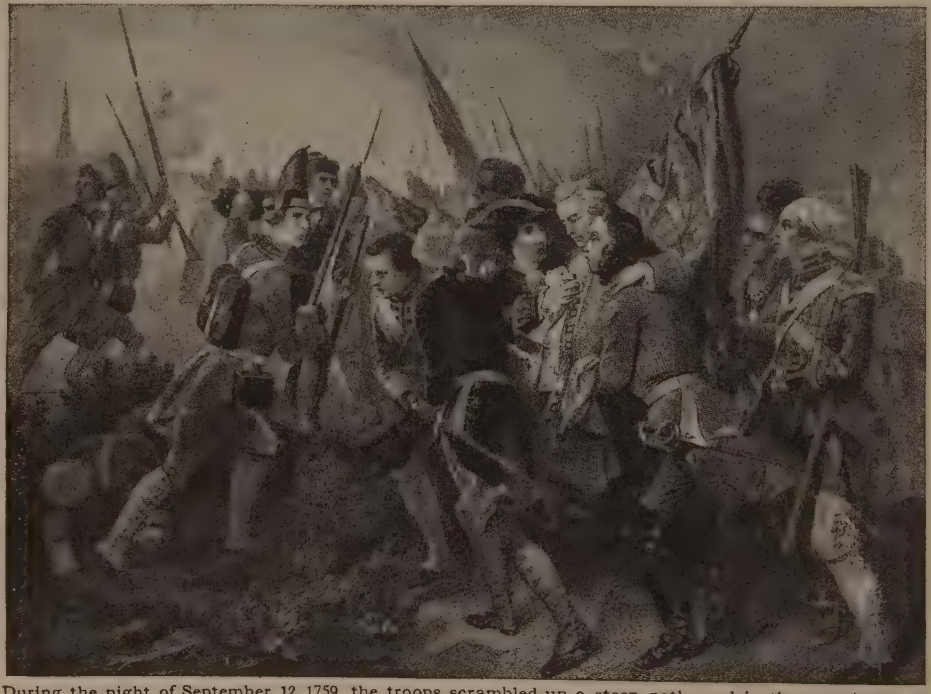


If we pretend to be better than we are, people will find us out.

The next Stories are on page 955

QUEBEC AND ITS CAPTOR

Quebec was founded by Champlain in 1608, and after it was fortified the French thought that it could not be captured. When General James Wolfe was sent to take the town in 1759, he thought out a plan which proved successful. This was to move his troops up stream and climb the cliffs behind the city.



During the night of September 12, 1759, the troops scrambled up a steep path, and in the morning were ready for battle. The French General Montcalm attacked, but was defeated, and both he and Wolfe were killed. The city surrendered, and as it was the strongest place the French had, peace was soon made, and France lost her American possessions. Not an acre of land was left her on the whole continent.

THE HISTORY OF THE UNITED STATES

WE have learned that Spain, England, France and Holland and Sweden all tried to plant colonies in North America, and that Sweden and Holland were forced out, leaving the three nations first named in possessions. The Spanish colonies were in the far South, and continued to belong to that power for a long time, but we shall learn in this article how France and England struggled for the rest of the continent, and how France lost in the end.

THE STRUGGLE FOR THE CONTINENT

CONTINUED FROM 525

WE have already learned that Englishmen planted many colonies on the Atlantic coast from Maine to Florida, and that, while some were divided, others were joined together until at last thirteen remained. In the meantime France had not been idle, as we learned in the second article. They built forts and towns upon the St. Lawrence River, in Nova Scotia, which they called Acadia, and on the Great Lakes. They explored the Mississippi River down to the Gulf of Mexico and sent out many missionaries to try to make Christians of the Indians.

THE ENGLISH BUILD HOMES IN THE NEW LAND

But there was a great difference in the kind of colonies that were planted. The English built homes in the new country and expected to spend their lives in their new homes. In all their colonies most of the people cultivated the ground, though in some of them fishing was also very important, and the New England colonies built many small ships in which they carried dried fish and timber to other English colonies, or to the Spanish colonies, and even to Europe. England left the colonies very much alone at first and the people learned to govern themselves and to be proud of their colony or province, as it was sometimes called.

The French colonies were generally sent out by companies which expected profits from the fur trade. They did not care whether the colony grew or not if they could get many soft furs which they could sell at a high price. Some wise men tried to settle permanent colonies, but they were not supported and the colonies did not grow strong as the English colonies did. Then, too, those in power in France sent out long lists of rules which had to be obeyed. The settlers had little liberty, and some pushed on into the Indian country where the rules could not follow them.

THE FRENCH COLONISTS EXPECTED TO RETURN TO FRANCE

Another great difference was this. English women came out from the first, and most of the settlers expected to live all their lives in the country. Very few French women came out, and many of the Frenchmen married Indian wives. Their children were more Indian than French and they did very little to build up the French power. The Frenchmen who did not marry expected to go back to France some day when they had become rich, and so did not do much to make the country strong. They lived in the woods like Indians and travelled far and wide—trapping animals, or buying their skins from the Indians.

The French knew better how to make friends with the Indians than the English did. The English despised them and almost destroyed some

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Indian tribes such as the Pequots, the Tuscaroras, and King Philip's men, who were called the Pokanokets. Some of the colonies offered rewards for Indian scalps. The French were friendly with all the Indians except the Five Nations. You remember how Champlain's mistake cost the friendship of these warriors. An Irishman named Sir William Johnson had more influence with them than anyone else and made them help the English.

The Jesuit Missionaries in New France

One reason for the friendship of the Indians towards the French was the great number of missionaries who visited all the tribes. The most important were the members of the Society of Jesus, which is a society in the Roman Catholic Church, and they were called Jesuits. Father Marquette and Father Jogues were two of the best known. Many were tortured by the Indians but as fast as one was put to death another stepped forward to fill the place, and at last their preaching had some effect except with the Five Nations who would not listen to them because they were French. As both powers grew in America the French determined to settle the Mississippi Valley, which they claimed because Father Marquette and La Salle had explored that great river. If they could do this they could keep the English east of the Alleghany Mountains. If you will turn to your map you will see how narrow that strip of territory is when you compare it with the Mississippi Valley. Real fighting began in 1690, though the year before the governor of New York had stirred up the Five Nations to make an attack on Canada.

Spain was not so powerful as two hundred years before, and France and England were almost constantly at war trying to settle which was the stronger, and fighting took place in America as well as in Europe. The first of these wars was known in this country as King William's War because William III was King of England at the time. A party of French and Indians burned the town of Schenectady, N. Y., in 1690, killed 60 persons and took 30 prisoners. Other smaller towns were captured and the inhabitants were killed. In 1690, however, the English and the New Englanders captured Port Royal in Acadia but failed to take Quebec. At the end of the war each power gave back all the places it had taken.

The Brave Mrs. Dustin and Her Terrible Experience

During this war a farmer named Dustin was at work in a field near Haverhill, Massachusetts, with seven of his children around him. When he heard the terrible war whoop one day, he seized his gun and kept the Indians back until he and the children reached a fortified house. At his own home, the Indians killed his baby by throwing it against a tree, and took Mrs. Dustin and another woman with them. A white boy, who was also a captive, told Mrs. Dustin that they were all to be tortured when the party, which was made up of nine men and boys and three squaws, reached the end of the journey. One night when all the Indians were asleep, Mrs. Dustin, the other woman and the boy very quietly got hold of tomahawks and killed ten of their captors. One squaw and a boy escaped. Then Mrs. Dustin scalped the ten Indians, and the three made their way back home, over a hundred miles through the forest. The government paid Mrs. Dustin a large sum of money for the scalps.

Queen Anne's War Gives Acadia to England

The war which broke out again in Europe in 1702 was called in America Queen Anne's War, and many towns were captured by the French with the aid of the Indians. At Deerfield in Massachusetts, in 1704, 60 whites were killed and 100 were captured. If any of the captives could not keep up as they were being taken away, they were tomahawked and scalped. Sometimes little children were killed because they were in the way. Haverhill was also attacked by the French and Indians and many people were killed. Later, in 1710, the English captured Port Royal again, and named it

Annapolis in honour of the Queen. At the end of the war (1713) the town was kept by the English and all Acadia, or Nova Scotia, as well, besides the country around Hudson Bay. France had now lost much territory, but was still powerful in America.

There was no open war between the French and English for more than 30 years now, though the people of New England believed that the French encouraged the Indians to make attacks upon the careless settlers. The war which was being fought in Europe finally reached America in 1744, where it was generally known as King George's War.

ESCAPE OF THE DUSTIN CHILDREN

A farmer named Dustin was working on his farm near Haverhill, Mass., with his children around him when he discovered the Indians. He seized his gun and was able to keep them back, while he and the children retreated. You may read of what happened to his wife and of her brave deed on the opposite page.

KING GEORGE'S WAR PROVED THAT THE COLONISTS COULD FIGHT

The French had built a very strong fort at Louisburg on Cape Breton Island, and thought it could not be taken. A force of about 4000 New Englanders under William Pepperell sailed to attack the fort in 1745, and with some help from a British fleet, took the fort and gained a large stock of powder and other ammunition. This was a very important event for it showed how the English colonists could fight. The fort however was given back to France when peace was made at Aix-la-Chapelle in 1748.

By this time the English colonists were beginning to think that they would soon need the land across the Alleghany mountains. The English kings had granted to Virginia, Massachusetts, Connecticut and Carolina the land from sea to sea, and the grant of Pennsylvania extended beyond the mountains. Though the waters of Lake Champlain flowed into the St. Lawrence River, the lake itself and the land around it were easier to reach from the English colonies than they were from the French. Besides the English wished to settle the land while the French wished to keep it open and uninhabited for the sake of the fur

trade. Everybody realised that peace could not last long and both sides prepared for a fight.

THE DIFFERENT CLAIMS TO THE VALLEY OF THE MISSISSIPPI

In the valley of the Ohio River was much game but few Indians lived there. Pennsylvania claimed a part of the land, and Virginia also said that it was a part of the territory which had been granted by James I. The French said that since the Ohio flowed into the Mississippi, all the land belonged to them because of the voyages of La Salle. They began in 1749 to send men all through the region to raise the French flag and to bury lead plates on which were the royal arms of France. The same year, the Ohio Company was formed by a number of wealthy Virginians, and it was their plan to settle a fourteenth colony along the Ohio River. Lawrence Washington, the elder brother of George, was one of the managers, and in 1750 much of the land was surveyed in what is now western Pennsylvania and West Virginia.

The French began to build forts in the region. The place where Pittsburg now stands seemed important to both parties and a few English settled in the neighbourhood, but did not build a strong fort, as it was claimed by both Pennsylvania and Virginia, and neither colony wished to spend money on a fort which might be given to the other. When Governor Dinwiddie of Virginia heard of these new French forts, he sent a messenger to warn the Frenchmen that they must leave Virginia territory. This messenger was George Washington, and in another part of our book you may read of his terrible journey through the forest.

A NEW FIGURE APPEARS IN AMERICA

The commanders of the French forts were very polite but they said they could not think of leaving without orders from the government of New France in Montreal, and then almost immediately the French began to build a strong fort on the place where Pittsburg now stands, and called it Fort Duquesne. Governor Dinwiddie sent some troops to drive away the French in 1754. The commander became sick, and George Washington, the second in command, took charge. Roads had to be cut through the woods in order to get the cannon and the wagons along, and sometimes the little army did not advance more than a mile a day.

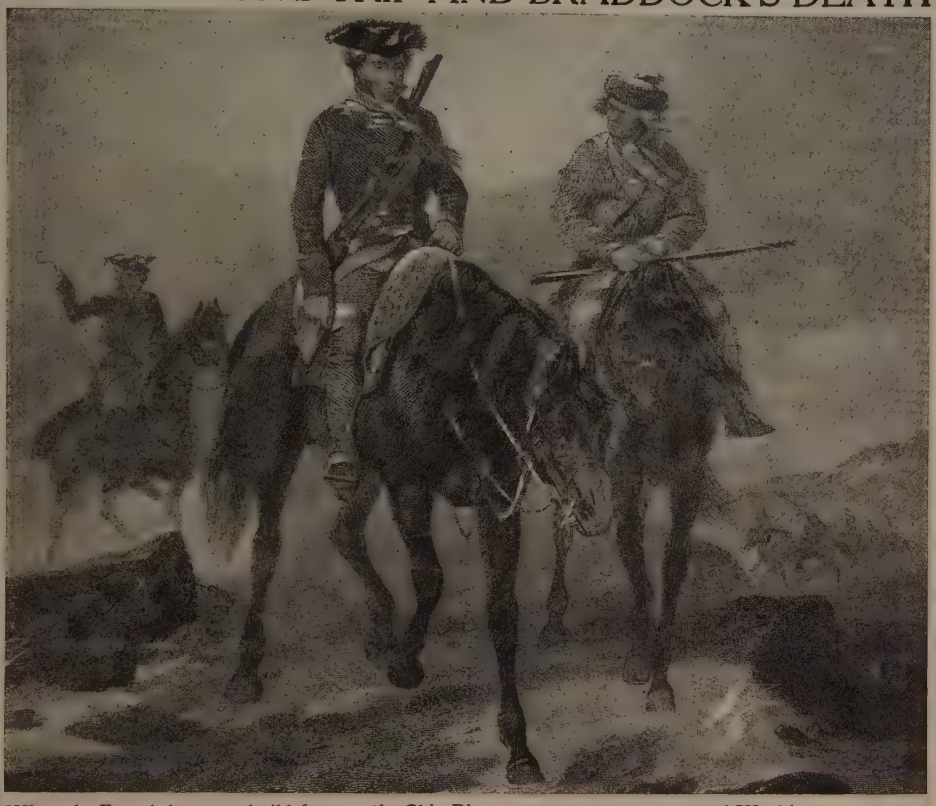
When they had crossed the mountains and had reached a place called Great Meadows, they met a small French force, ten of whom were killed and twenty-two were captured. While waiting for other troops to come to his assistance Washington built a rude fort which he called Fort Necessity. The troops came and Washington's force now amounted to about 300 whites and 150 Indians, who were under a chief called Half-King. There were now about 1400 French at Fort Duquesne and 600 of them marched to find Washington. The English had very little powder, and after it was gone they surrendered, but were allowed to march away. Half-King did not think very highly of such war and said that the French acted like cowards and the English like fools.

War had not yet been declared, but both nations at once sent troops to America. General Edward Braddock with about a thousand English regular troops reached Virginia early in 1755, and soon a plan was made to attack the French in four places at once. They were at Fort Duquesne, on Lake Ontario, on Lake Champlain and on the border of Acadia, which was at this time a British possession. General Braddock was to take Fort Duquesne.

A BOASTFUL ENGLISHMAN COMES TO GRIEF

Besides his British troops, nearly 500 Virginians were with Braddock when he started on the march, but he did not care much for these nor for the help of the Indians. He knew nothing about fighting in the woods and thought that his trained troops were worth more than any others. When Benjamin Franklin tried to warn him of the dangers he would meet

WASHINGTON'S TRIP AND BRADDOCK'S DEATH



When the French began to build forts on the Ohio River, a young surveyor named Washington was sent by the governor of Virginia to order them away. With a few companions he reached the French forts.

General Braddock, who led an English army into the wilderness to attack the French did not understand how to fight the Indians, who fought from behind trees and would not come out to be shot at. Only the Virginia troops who were used to such fighting prevented all from being killed. General Braddock died from his wounds, regretting that he had not been wise enough to take advice.

he answered that the Indians might make trouble for the raw militia, but that they could make no impression on the king's regulars. Some of the colonists grew angry and left.

His army at last came close to Fort Duquesne. He was met, July 7th, 1755, by a party of Canadians and Indians under Captain Beaujeu. The British fought bravely but they could not see anybody to shoot at, for the Canadians and the Indians fought from behind trees, while the British stood in the narrow road. It is not true that Braddock was surprised, for he knew that he was coming to a dangerous place, but he did not know how to meet the enemy and he was too obstinate and too stupid to learn. The bright red coats of his army made good marks. Braddock himself was everywhere, encouraging or scolding his men, but it was of no use. The Virginians fought from behind trees and logs and kept the enemy from killing everyone, but Braddock would not allow his soldiers to protect themselves at all. They stood just as if on parade. At last Braddock received a wound from which he died in a few hours, and George Washington led away what was left of the little army. Out of about 1500 men nearly 1000 were killed or wounded.

THE FOUNDATION FOR THE STORY OF EVANGELINE

This same year the French inhabitants of Acadia were sent away from their homes. The poet, Longfellow, in "Evangeline," has told the story, but all that he tells is not quite true. All of the Acadians were not so good as he says, and the English were not so cruel. The Acadians did not like to have their country belong to England, and many of them plotted with the French and the Indians. The English found that they could not keep Acadia unless something was done, and decided to send the Acadians to the different English colonies where they could not do so much harm. Most of the families were kept together but some were separated in the rush and the hurry, and it is of one of these cases that our poet writes.

THE FRENCH AND INDIAN WAR BEGINS AT LAST

All these battles had been fought while England and France were supposed to be at peace, but in 1756, war was declared and began in earnest. It was called the Seven Years' War in Europe but in America was called the French and Indian War. The French sent out a good general, the Marquis de Montcalm, who soon began to win victories for France, but he could not control his Indians. When they helped to capture a fort or an army, they thought they had the right to kill all they captured. When Fort William Henry on Lake George was taken, Montcalm promised that the English force should go home unharmed, and the Indian chiefs agreed, but after they started the Indians killed all the wounded and kept making attacks in the column until they had killed six or seven hundred. At another time, Israel Putnam, whom we shall meet again in the Revolution, was captured, fastened to a stake, and the flames were already curling about him, when he was set free by a French officer who was not afraid of the Indians.

THE FRENCH ARE SUCCESSFUL AT FIRST

We can not tell of all the battles and massacres which took place in the next few years. In nearly all of them the French won and many English and many Americans were killed and scalped. William Pitt was now in charge of the war in England, and he was determined to drive the French from North America. He was not willing, as other English statesmen had been, to take a little bit of territory here and another there, but he intended to take it all. So many soldiers were sent out that the American colonists were encouraged to raise money and men for the war.

In 1758, Louisburg on Cape Breton Island, was again taken, though the French thought it too strong to fall. In this capture, we see for the first time in America, the soldier who was finally to end the war, General James Wolfe. Though Sir Jeffrey Amherst

and Admiral Boscawen were in chief command, the credit of taking this fort must go to Wolfe, for it was he who forced the French to abandon the Grand Battery and finally to surrender. With the surrender of Louisburg, the St. Lawrence was open for the entrance of the English fleet, and all eyes next turned to Quebec, as the prize for which the English must fight the next summer.

THE INDIANS BEGIN TO DESPISE THE ENGLISH

Victories were necessary for the English. The Iroquois hated the French, as you have been told before, but they were beginning to despise the English who could not overcome the enemy of both. If the French continued to win victories soon the Six Nations would refuse to help the English longer, for the Indians never liked to be on the losing side. They had seen the English and Americans lose Fort Oswego and Fort William Henry, and fail to capture Ticonderoga. Indians came to visit Montcalm, saying that they wished to see the man who trampled the English under his feet.

THE TIDE TURNS AND THE ENGLISH WIN VICTORIES

After Louisburg the tide turned, and English victories came rapidly. Fort Frontenac, built of stone by La Salle, where Lake Ontario flows into the St. Lawrence, was taken and battered down by its own cannon. An immense stock of war material was taken across the lake or destroyed. The Six Nations decided that perhaps the English might win after all, and they became sure of it a few months later when Fort Duquesne also fell into English and American hands. The little settlement around the fort was named Pittsburg and the next year Fort Pitt was built. From that small beginning the great city of to-day has grown.

THE GENERAL WHO TOOK QUEBEC AT THE COST OF HIS LIFE

With the beginning of fighting in 1759, more English successes came. Fort Niagara at the mouth of Niagara River fell, and shortly afterward Ticonderoga was given up to the French. As rats desert a sinking ship, the Indians grew less willing to help the French, while on the other hand the Six Nations forgot that they had even thought of ceasing to aid the English.

Quebec still remained in French hands. Built high on a cliff, over two hundred feet above the St. Lawrence River at the point where the St. Charles River empties its waters into the greater river, the French boasted that it could not be taken. General Wolfe, who had been ordered to take the fortress, came up the river in June, 1759, and during the whole month of July, sat before the city trying to find a way to take it. Sickness seized his body in August but his mind was always on his task. He felt that he could not live long and begged the doctor to "patch him up enough for this business."

Attack in front was impossible, and below the city there was no hope of success. Wolfe then rowed up the river, and his keen eyes finally spied a path along the side of the cliff, used perhaps by goats, or by reckless young men who wished to get quickly to the water's edge. Moving his ships up and down the river without any reason that could be seen, he puzzled General Montcalm who could not imagine what the British were trying to do. On the night of the 12th of September, a part of his men pretended to make a landing below the city, and Montcalm himself spent the night on horseback ready to drive them back.

All was quiet further up the river above the city, but at midnight 1600 men in small boats stole down the stream in the shadow of the cliffs. Wolfe in his boat was repeating verses from Gray's "Elegy in a Country Churchyard," and said to one of his friends, "I would rather be the author of that poem than take Quebec."

THE FRENCH ARE SURPRISED AND BEATEN

Quietly the soldiers landed and began the steep climb up the cliff, which they gained before the sentinels knew of their presence. Before six o'clock, the 1600 were drawn up on the broad field at the top of the

cliffs, called the Plains of Abraham. Three thousand more soon followed. Montcalm marched out of the city to meet the English as soon as he could, and a fierce battle followed.

On this broad plain the English had the advantage just as the French had it in the woods. Wolfe's soldiers were English regulars who were used to fighting in open spaces where they could hear the orders of their officers. A large part of Montcalm's force was made up of Canadians, who were splendid fighters in the woods where they used Indian methods, but did not do so well in the open ground.

Wolfe was wounded in the wrist but tied a handkerchief around his arm and kept on. A ball struck his leg, but still he did not stop. A third bullet passed through his lungs. He fell, and was carried to the rear, as you can see in one of our pictures. As he lay there apparently dead, he heard an officer say, "See how they run!" The dying man tried to raise himself saying, "Who run?" When told that the French were giving way everywhere, he sank back whispering, "God be praised, I will die in peace."

The brave French commander dies defeated

The brave French commander met the same fate. He was struck in the chest, but at first seemed not to feel the wound until all at once he fell from his horse. When told that he was dying his answer was, "So much the better. I shall not live to see Quebec surrendered." A few days later the city opened its gates to the English. Now upon the plains of Abraham stands a tall monument erected in honour of two brave men who died, one at the moment of victory and the other in the bitterness of defeat.

The next year an unsuccessful attempt to retake Quebec was made, and Montreal fell. The colony of New France was conquered, and English officers ruled. The war continued in Europe, however, and in 1762, Spain joined in to help France. The English fleet was too strong for the allies, and Cuba and the Philippine Islands were taken from Spain. Peace was made the next year (February 10, 1763) and the map of North America was made over.

The new map of North America after 1763

England took all New France and all the eastern half of the Mississippi Valley from France, but gave back Cuba and the Philippines to Spain. In return for these islands, however, she took the Floridas from Spain. East Florida was almost the same then as the present state, and West Florida was a strip of land along the Gulf of Mexico and reaching to the Mississippi River. Since Spain had lost some of her valuable possessions because she had come to the aid of France, that country gave to her the city of New Orleans on the east bank of the Mississippi, and all the territory claimed by France west of that river extending to the Rocky Mountains on the west, and to the head of the Missouri River on the north. We shall meet with this territory again under the name of Louisiana.

This left France without a mile of territory on the mainland of North America. Only two powers remained. England controlled the eastern half of the present United States, eastern Canada, and claimed a great unexplored territory west of Hudson's Bay. Spain controlled Central America, Mexico and most of what is now the United States west of the Mississippi River, as well as the mouth of that stream.

England's victory brings troubles with it

The struggle for the continent was over in Europe for the present, and the great question for England to settle was what to do with her possessions. The war had cost many men and much money, and the Indians were not friendly. The colonies had cost much more than had been received from them, and they seemed likely to be a cause of expense for many years. Could they be made to pay a part of the cost of protecting them from the Indians? We shall learn the answer in our next article.

Continued on page 977

THE WONDER OF A BOOK

CONTINUED FROM 809

A BOOK is one of the great marvels of the world. Perhaps a newspaper is more wonderful still, because a newspaper comes and goes almost in an hour, and yet it has in it the work of thousands of men. Your father buys a newspaper for one or two cents., and tears it up when he has done with it; yet that paper is something like a miracle. It may have had its beginning hundreds of years ago, for the very paper itself was no doubt made from a tree. We saw on page 745 how a beautiful tree lives its life for years and years, and helps to beautify the world, to be cut down, often when it is most beautiful, and made into furniture, or lead pencils, or paper.

The pictures on the following pages show us how our own book is made, from the very beginning of it to the moment it is ready for us. But it is not possible to give any idea in pictures of the great work and thought that go to make a book. Men must think about it, and write their thoughts on paper, and no pictures can show us how many men have been thinking for years and years about the things set down in our book. We can see the men cutting down trees; we can see the men making paper; we can see the printers at work. But the real thought that makes a book can never be seen.

When men first began to write, it must have seemed a wonderful thing to be able to write words that would make men *feel*, words that would make men laugh, or weep, or stir them to do great things. As soon as men began to think at all, they wanted to put down their thoughts somewhere for other men to know; but there was not a single piece of paper then in all the world, and men scratched their thoughts on stone. They made clay bricks and stamped them with signs, like those on page 5099; for thousands of years these were the only books.

One of the greatest changes in the world has been the change from these books of long ago to the books that we read now. Nothing can show us more clearly the wonderful power of man and the wonderful way in which he has learnt the secrets of Nature. All that men think is written to-day in books, just as all that men have seen is painted in pictures. Nothing has been able to stop the men who write books. Kings have tried to stop them, great tyrants have burned their books, and writers have been tortured by fire. But nothing can ever destroy the power of writing or stop the growth of books, because books have spread themselves now throughout the world, and there is no part of the world without them. They are the only things that live for ever; because, although one book may perish, new copies are made as the old ones pass away.

And so through all the ages of time a book carries the thoughts of men. A thought put into a book is stronger than a statue carved in marble, and in the story of the world the pen has been far mightier than the sword.

WHAT THE PAPER IS MADE OF

Paper is made of many queer things —of a certain kind of grass called Esparto grass, grown in Spain and North Africa; of wood pulp—that is, thin slices ot wood cut from trees and made soft; or of rags. The first picture shows the man wheeling the grass into the cleaning-house, where the great change in its life is to begin. The second shows the men bringing the wood pulp. The grass and the pulp are seen here as received at the mill.

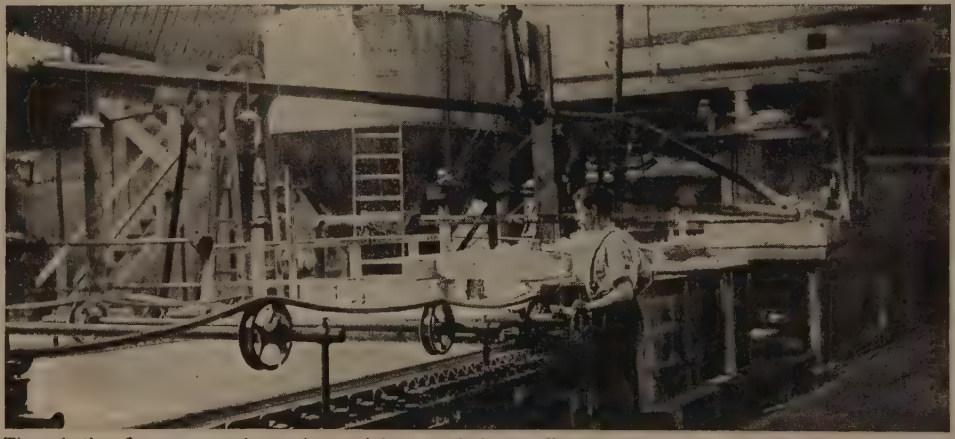
The women workers are here cutting up, sorting, and cleaning old linen collars and cuffs and rags, of which paper is to be made. When you throw away a piece of rag, or a torn cuff, or an old collar, it is very likely indeed that it will find its way to the paper-mill, and once there it will find its way back to somebody, perhaps as part of a book or a piece of writing-paper. Some part of your exercise book may once have been a piece of a boy's collar or a girl's handkerchief; such changes in these things take place every day.

Whatever material the paper is made of, it must all pass the same way to become paper; the grass, the rags, and the wood pulp all find their way to the boiler. They are first pulled into pieces by the women, and then thrown into a dust extractor, which spins round quickly and shakes them free from dust. They are afterwards taken to the boiler, as seen in the second of these two pictures, where the materials for the paper are being boiled in steam.

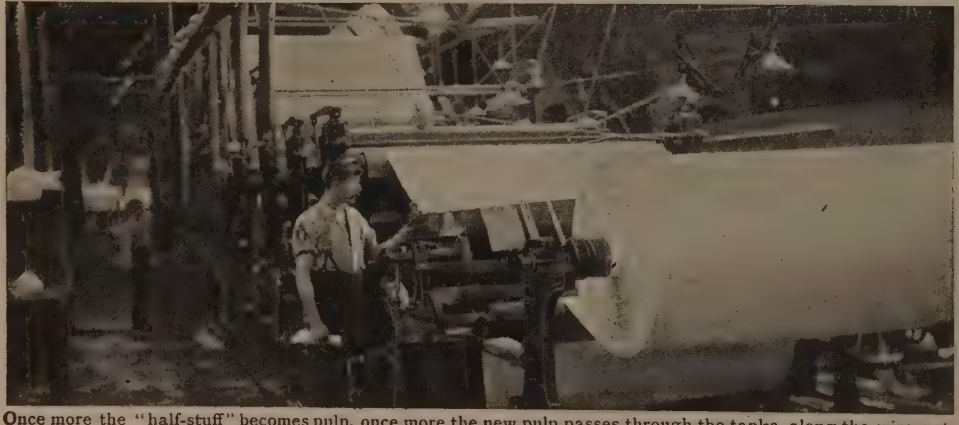
From the steam-boiler, the material is taken to the bleaching tank. The man is here seen putting the grass into the tank, where it is further purified by being washed in pure water mixed with bleaching powder.

THE WHITE RIVER OF FLOWING PAPER

The material is becoming what is known as paper pulp. This is mixed with a kind of glue, which strengthens it and holds it together, and with a colouring to make it any colour required. In this picture the pulp is going round and round in the tank, being stirred by a fork as it passes under the circular cover. So it is stirred until it becomes the proper stiffness, when it passes into the enormous tank seen below, to be stirred and mixed with water.



The pulp then flows over a wire netting, and the water is drawn off, so that the pulp becomes firm. It is a wonderful thing to see the paste, almost like water, on one side of a roller, and to see it, the next moment, only a few inches away, on the other side of the roller, white and dry. But it is still only "half-stuff," and must be strengthened by being put through nearly all these changes again before it reaches this machine, which makes it perfect.

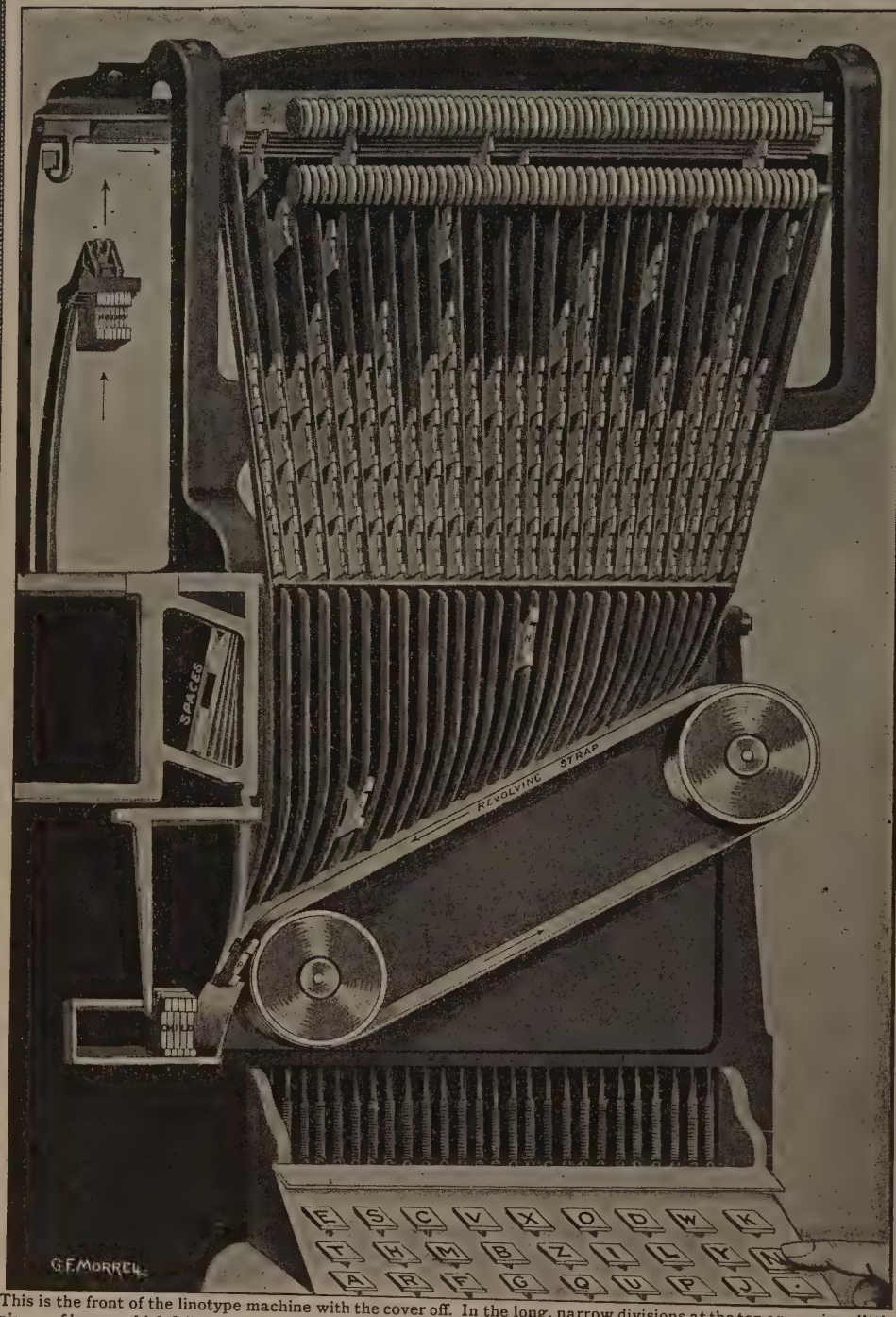


Once more the "half-stuff" becomes pulp, once more the new pulp passes through the tanks, along the wire netting, through the heavy rollers. The rollers become heavier and warmer, until at last the "paste" passes along the machine in the middle of this page, strong and thin and dry, finished paper ready to wind on these rolls. The roll shown here contains five miles of paper. Many trees, many fields of waving grass, end their lives on a roll like this.

THE BEGINNING OF THIS BOOK

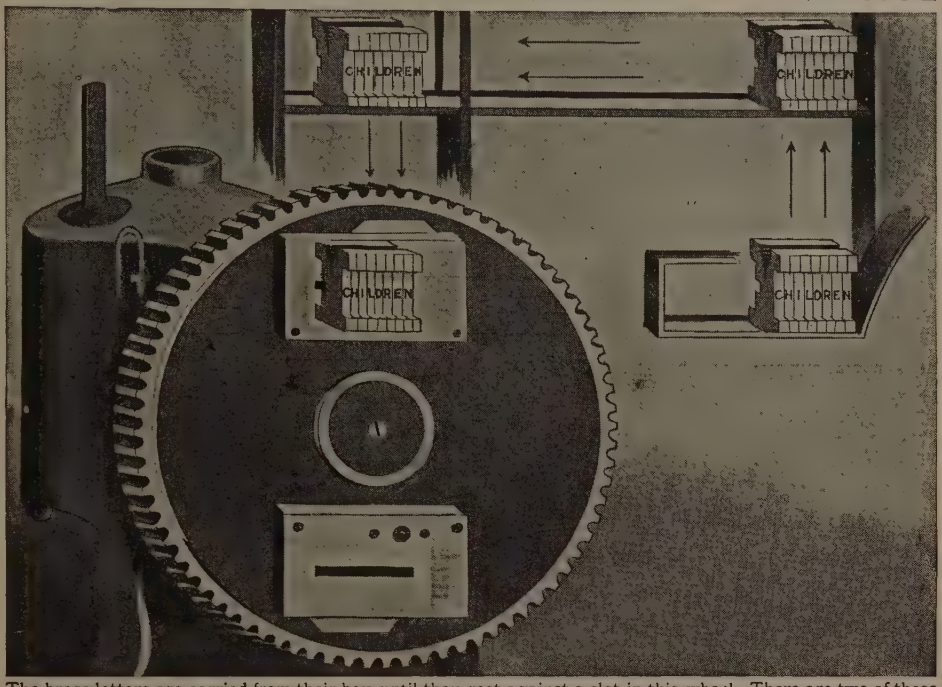
When the writer has set down his thoughts on paper, and the editor has prepared it for the printers, it is then passed on to be set up in type. In the small picture on this page the master-printer is marking the copy for the boy to take to the man at the machine. This machine is the most wonderful thing in printing. It almost thinks. By pressing down keys as we do at a typewriter, or a piano, the man at this machine sets the words in metal lines. Almost as fast as a man can think, this machine puts his thoughts into solid metal. The machine is called a linotype, because it sets up lines of type. The pictures on the next two pages show us how it works.

THE MACHINE THAT ALMOST THINKS

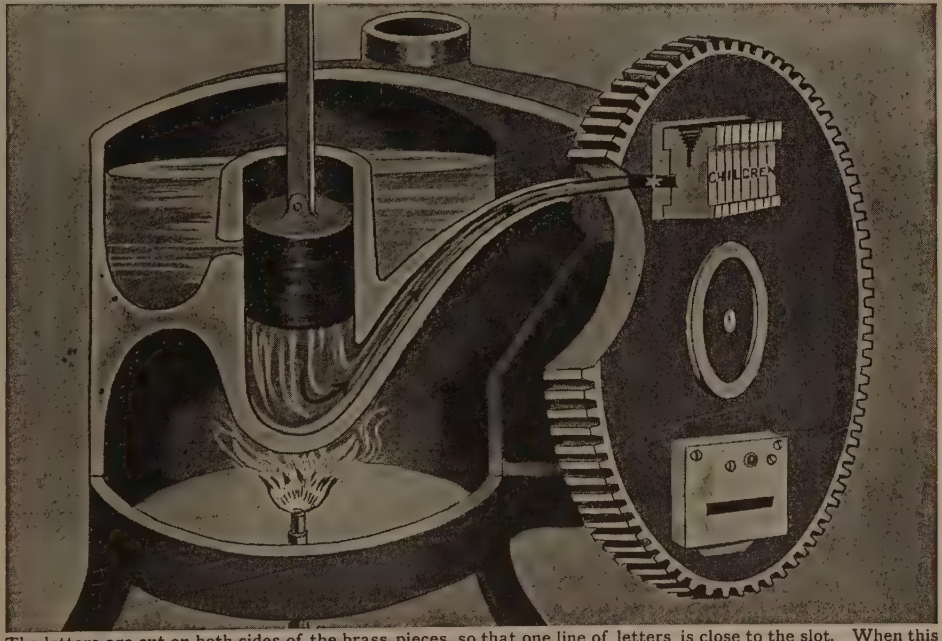


This is the front of the linotype machine with the cover off. In the long, narrow divisions at the top are curious little pieces of brass, which fall as the keys are touched. The man has just pressed down the N, and the brass piece with N on it is the last letter we see falling. The letters fall on to the revolving strap, and are carried into a little box above the keyboard on the left. If you look at this box, you will see five little pieces of brass in it, with the letters CHILD. Coming down are the letters REN so that we have the word CHILDREN. A wonderful thing is to happen to these letters in brass before they are carried back to their places by the long arm on the left at the top.

HOW THE WORDS ARE WRITTEN IN METAL



The brass letters are carried from their box until they rest against a slot in this wheel. There are two of these slots, to save waste of time. The letters are cut into the brass—not raised up on it. They are cut in the brass as a boy cuts out his name on a tree. If boiling metal could be poured in o the name cut on the tree, the metal would have the mark of the letters when it cooled down, and this is what happens on the linotype machine.



The letters are cut on both sides of the brass pieces, so that one line of letters is close to the slot. When this line of letters is ready, a heavy punch comes down into a copper of boiling metal behind the wheel, and forces the metal up a little passage until it runs into the slot where the brass letters are. This picture shows the copper as if it were cut in two, and the slot where the letters are formed is marked with a star. In a moment the metal rushes back into the copper, the wheel turns, bringing the empty slot into position, and the letters that are done with are carried along an iron band, from which they fall into their places ready for use again.

PREPARING THE STORY IN METAL FOR THE PRINTING PRESS

The story which was first written on paper is now in words of metal, and as the metal lines are ready they are put together so as to form columns like those in our book. The man at work in this picture is putting the lines together.

Before the story can be printed the printers must be sure that there are no mistakes, so a proof is pulled—that is to say, an ink roller is passed over the type, and a sheet of paper is pressed down upon it so that the type is printed on the paper.

The proofs are then taken to the readers. Every page in a book must be corrected several times before it can be printed, and the reader is supposed to be a man who neither makes mistakes himself nor lets other people's mistakes pass.

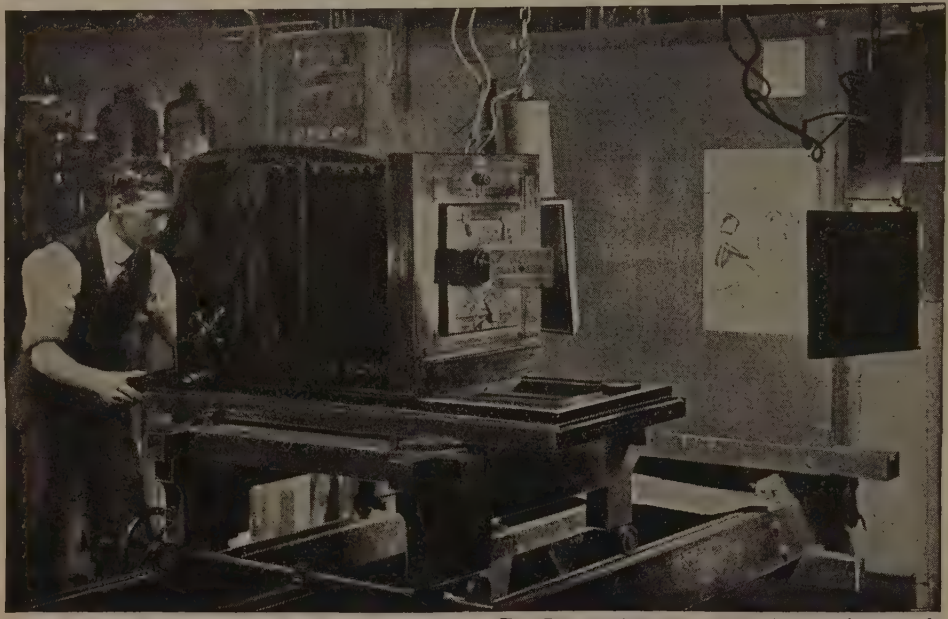
THE STORY IN METAL STAMPED ON PAPER & BACK TO METAL AGAIN

The type is made up into pages, and a piece of prepared paper is placed over it. A steam brush comes down upon the paper with great pressure, so that the metal letters are printed heavily upon the paper—not with ink, but as a new penny prints itself upon soft paper if you press it with your hand.

The paper page, called the matrix, is placed over a hot plate until it is stiff, so that it could be sent away to be printed anywhere. It is now bent round into a curve and put into an iron casting-box. A ladleful of melted metal is poured into the box, and runs smoothly over the matrix.

When the box is opened the metal has set into a solid plate, curved as in this picture. On the right we see the paper matrix; on the left is the new metal plate made from it. Every mark on the matrix is repeated on the metal plate, so that the words can now be read on the solid metal.

MAKING PICTURES FOR THIS BOOK



These pictures show us how the pictures come into THE BOOK OF KNOWLEDGE. When a photograph has been taken, or when an artist has drawn his picture, it is photographed by the enormous camera seen here. The picture is on the right with a strong light shining on it, and is photographed direct on to a metal plate, just as the photographer takes your portrait on glass. But there is a very important difference between photographing for a book and taking a portrait. The large white square in front of the picture here is a fine screen, which breaks the picture up into dots, so fine that you cannot see them, and so close together that they seem all one and do not spoil the picture. You can see them if you look at this picture with a strong magnifying glass.

These little dots are of the highest importance; without them we could have no pictures like this in our book, because if the ink were pressed on to a smooth surface it would become a blur. The dots give the ink something to "catch hold of," and the block is so made that the ink will only print where there are dots. The metal plate is inked over and placed in a moving bath of acid, which eats away the metal where there is no ink. The ink protects the dots so that the acid cannot affect them, but the acid wears down what is not inked, leaving the picture made up of dots. This is then fixed to the metal plate. Some pictures, like those on page 974, which are made without a screen, are made with the plate, but pictures like this must be made separately and fixed on.

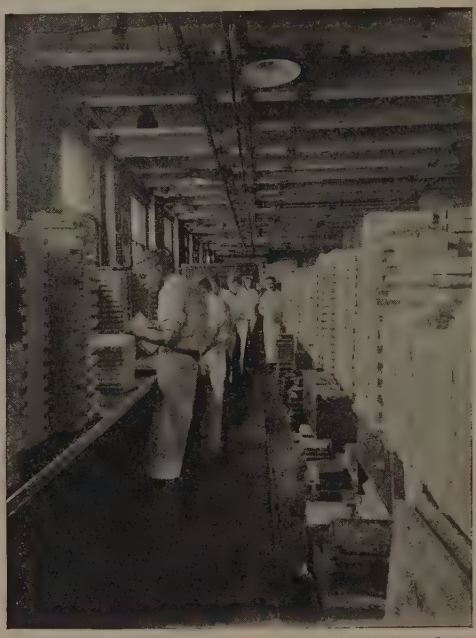
THE MACHINES THAT PRINT THIS BOOK

The plate is now ready and has been fixed in its place on the printing-press. It requires many hours to prepare it for printing. Then the machine will commence to print the sheets. These presses print much more rapidly than the old hand presses. To the left are piles of sheets already printed.

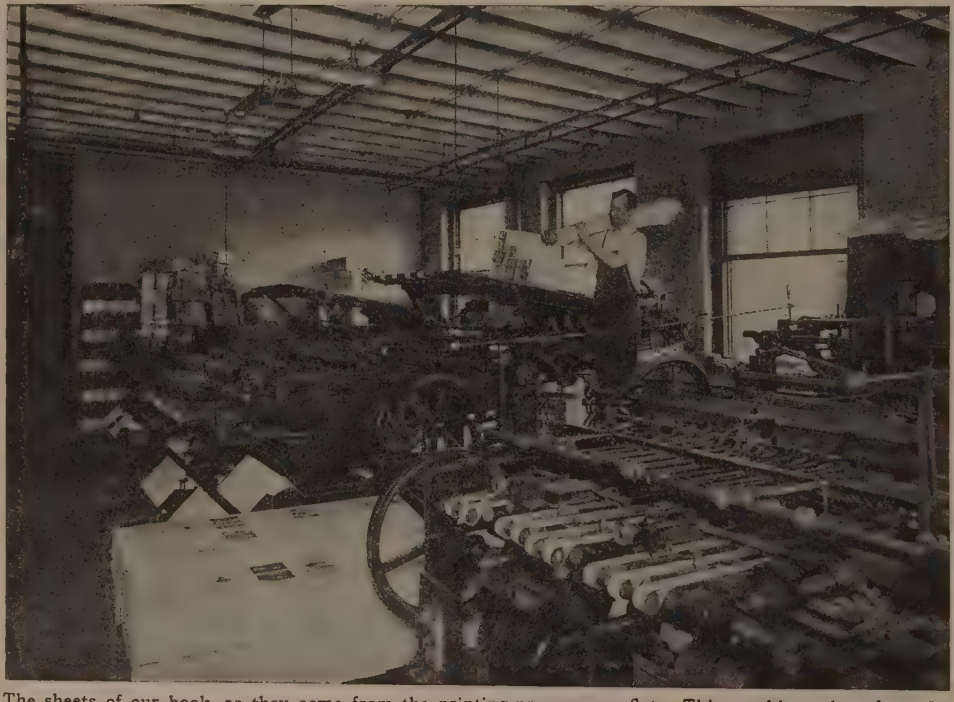
Here is a picture of another machine at work. To print an edition of The Book of Knowledge, many machines are necessary, to keep ahead of the apparently endless procession of boxes of paper that come from the paper mill. An edition of the Book of Knowledge weighs many tons, and its preparation requires the services of many men and women for a long time.

BOOK BINDING

The sections of the book are here being stitched into place on a marvellous machine which does more perfect work than is possible by hand.



These men are engaged in rounding the backs of the stitched and trimmed volumes, and preparing them to receive their covers of cloth or leather.



The sheets of our book, as they come from the printing-presses, are flat. This machine takes these flat sheets, saws them into strips of sixteen pages each, and delivers them accurately folded, ready to go to the stitchers for sewing. The work of this machine comes before that shown in the two pictures at the top of the page.

The next Pictures of Familiar Things are on page 1015

CERVANTES AND HIS BOOK

IN the early years of the seventeenth century stories of the impossible deeds performed by wandering knights were almost the only books read in Spain, where lived the great author whom we call Cervantes. Cervantes decided to ridicule these absurd stories out of fashion; and so he wrote "The Adventures of Don Quixote." The hero of this book is a kindly old gentleman whose head has been turned by reading trashy stories of knights and ladies fair, and this story of his adventures is one of the greatest works in literature, for its abounding humour, its wisdom, and its true humanity, as well as for its pictures of the life of Spain 300 years ago. All the stupid stories of knights and enchanters which were being read when Cervantes wrote his book have been forgotten for ages, but "Don Quixote," first published in 1605, still remains one of the favourite books in the world's library.

ADVENTURES OF DON QUIXOTE

CONTINUED FROM 692

IN a certain village of La Mancha, a territory which is partly in Arragon and partly in Castile, two old kingdoms of Spain, there lived an elderly gentleman whose ways of thought were more exalted than his means. His household consisted of a housekeeper, a niece, and a man-of-all-work. Three-quarters of his income went on food, which was of the most humble kind. The rest was laid out on a plush coat, velvet breeches, with slippers of the same material, for holidays, and a suit of homespun for everyday use.

He was about fifty years old, of a hale and strong complexion, lean-bodied and thin-faced, an early riser, and a lover of hunting. He passed the greater part of his time in reading books about the doughty deeds performed by knights in the brave days of old. So absorbed did he become in these tales that he sold much of the land he owned in order that he might be able to buy the books.

He was so much loved and respected by those who knew him that not only his niece and his servants became alarmed at his odd behaviour, but his neighbours also were concerned for his welfare. For while the older books that he pored over were of value, he bought many that were quite worthless, and grew so fascinated with them all that he was unable to tell the good from the bad.

At last he was convinced that the only course left open to him was to become a knight-errant himself, to arm himself in the old-fashioned way, and to go out into the world in search of adventure, and, by redressing all manner of wrongs and grievances, to win honour and renown. Full of this idea, he secured a suit of armour that had belonged to his great-grandfather, and had for many years lain by and rusted in a corner of his house. When he had cleaned and repaired it as well as he could, he found that there was no vizor to the helmet. So he made one of pasteboard. Then, being anxious to see if it was cutlass-proof, he drew his sword and tried its edge upon the pasteboard. At the very first stroke he undid in a moment what he had taken a whole week to complete.

Undaunted, however, by this disaster, he made another vizor, fencing this one with some thin plates of iron on the inside. Satisfied with his handiwork, he next thought of his horse.

In his stable was a sorry-looking animal, which, however, he was convinced would compare favourably with any of the famous steeds of which he had read. For four days he was at a loss for a name that would suit such a splendid creature. He decided to call him Rozinante, meaning thereby a horse that, from being an ordinary animal, had become "second to none."

Having decided that he himself would thenceforth be known as Don

Quixote de la Mancha, in order to immortalise his native place, he thought that there was nothing wanting now but a lady upon whom he might, in the ancient manner, bestow the empire of his heart. "Should I," said he to himself, "chance to encounter some giant, and happen to lay him prostrate on the ground, transfixed with my lance, or cleft in two, or, in short, overcome him and have him at my mercy, would it not be proper to have some lady to whom I might send him as a trophy of my valour?" Now, it chanced that there lived not far away a good-looking country lass, whose name was Aldonza Lorenzo. He thought she would serve admirably, if she had but a name more like that of a princess or lady of quality, so at length he decided to call her Dulcinea, with the addition of "del Toboso," from the place where she was born. Thus provided with all that was necessary to his present way of thinking, he donned his armour, and one fine July morning mounted Rozinante and sallied forth secretly to meet his first adventure. As he rode along, he was struck suddenly with the thought that he had never been "dubbed" or created a knight. Moreover, he remembered that until he had been dubbed a knight he could neither meet another knight in single combat nor wear dark armour. These thoughts at first shook his resolution, but he resolved that he would be dubbed a knight by the first he should meet, while he would scour his armour at leisure until it should look whiter than ermine. Thus fortified in his plan, he went on his way until evening drew on and he espied an inn.

DON QUIXOTE POLISHES HIS ARMOUR

HOW DON QUIXOTE BECAME A KNIGHT

The Adventure in the Courtyard

Both Don Quixote and his steed were sorely in need of rest and refreshment when they came up to the inn, at the door of which stood two young women who were going to Seville with some carriers, all of whom were taking up their lodging for the night.

Now, our traveller no sooner saw the inn than he fancied it to be a castle, fenced with four towers, with lofty pinnacles glittering with silver, together with a deep moat, drawbridge, and all other devices peculiar to such strongholds. He thereupon halted, fully expecting that some dwarf would appear on the battlements and sound his trumpet to give notice of the arrival of a knight.

Just then a swineherd sounded a horn to call his pigs together from the stubble-field. Imagining this to be the expected signal, Don Quixote rode up to the entrance. At his approach the two young women started to run away in alarm, but Don Quixote, lifting up his vizor and disclosing his withered, dusty face, accosted them, with comely grace and grave delivery, in this manner:

"Do not fly, ladies, I beseech you, nor fear the least offence. The order of knighthood, which I profess, forbids me to offer injuries to anyone, and least of all to damsels of such high rank as your presence denotes."

As the young women laughed outright at this, Don Quixote, speaking in a tone of grave reproof, observed that modesty and civility were very becoming in the fair sex, whereas laughter without sufficient reason was but foolishness. "But," added he, "I do not presume to say this to offend you. My only wish is to do you service."

This speech only increased the mirth of the young women, and our knight's

anger was rising when the innkeeper luckily appeared, and, holding the stirrup for Don Quixote to dismount, invited the latter to enter the inn and partake of such cheer as it afforded. Don Quixote, observing the humility of the governor of the castle—for such the innkeeper and the inn seemed to him to be—replied, "Señor Castellano, the least thing in the world suffices me; for arms are the only things I value, and combat is my bed of repose."

Having besought the innkeeper to look well to his steed, Don Quixote entered the inn, where, with the help of the two good-natured young women, he divested himself of his armour, with the exception of the helmet. This he had fastened on with ribbons, and as these had become tangled, and he would not allow them to be cut, he had to be fed by the young women and the landlord.

When he had partaken of his frugal meal in this awkward manner, he called his host to the stable, and here, falling down at his feet, declared he would not move until the governor had promised to dub him knight. All that night, he said, it was his intention to watch his armour in the chapel of the castle, so that the ceremony might take place in the morning. The innkeeper, who had a sense of humour, promised to do what was asked of him, but observing that, as the chapel had not yet been rebuilt, his noble guest might watch his armour just as well in the courtyard. The host next asked Don Quixote if he had any money, and, on being told that he had not, informed him that all knights should carry money and clean shirts. Don Quixote, having said that he would see to this in the future, took his armour into the courtyard, placed it in a dry horse-trough, and began his vigil. While he was so engaged, one of the carriers came out to water his mules. When Don Quixote saw this man approach the trough for the purpose of removing the armour, he cried out:

"O thou, whoever thou art, rash knight, that prepares to lay thy hands on the arms of the most valorous knight-errant that ever wore sword, take heed; do not attempt to profane them with a touch, lest instant death be the reward of thy temerity."

But the carrier paid no heed to this warning, and very promptly lifted the armour and threw it out of his way. On this, Don Quixote, calling upon his lady, Dulcinea, in knightly fashion, knocked over the carrier with a heavy blow from his lance, restored the armour to its place, and marched backward and forward with as little concern as if nothing had happened.

Soon after another carrier came out, and, not noticing the form of his comrade on the ground, also attempted to remove the armour. Don Quixote thereupon hit the man so heavily with

THE INNKEEPER, TO GET RID OF HIS AWKWARD GUEST, MAKES DON QUIXOTE A KNIGHT

his lance that his cry of alarm brought out the landlord and all the people of the inn. Very quickly Don Quixote was defending himself from such a volley of stones that he had to shelter himself under his shield, calling out at the same time that they were false and treacherous villains, and that the lord of the castle was a base and inhospitable knight to suffer a knight-errant to be so abused. He carried himself at the same time with so much spirit as to strike fear into the hearts of his assailants, so that they yielded to the appeal of the landlord and stopped the attack.

But the landlord, anxious to be rid of so troublesome a guest, made apologies for the carriers, and, remarking that two hours' vigil was sufficient, whereas Don Quixote had already been watching his armour for four hours, hinted that the ceremony of dubbing him a knight could now proceed. Don Quixote, believing him, asked him to make an end of the business as soon as possible. Further observing that the rest of the ceremony might be performed as well in a field as in a chapel or anywhere else, the landlord fetched his account-book, and, calling upon the two young women previously mentioned, also a boy, whom he caused to hold a lighted candle, asked Don Quixote to kneel.

Then pretending to read from his book, the landlord lifted up his hand and gave Don Quixote first a good blow on the neck with his hand, and, secondly, a gentle slap on the back with the flat of his sword. He next ordered one of the women to gird the sword about the knight's waist. Her companion having buckled on his spurs, the knight thanked them all, and, Rozinante being brought forth, he rode away, the landlord being so glad to see him go that he did not ask for the reckoning.

Thus it was that Don Quixote de la Mancha was dubbed a knight.

DON QUIXOTE CHALLENGES THE MERCHANTS

The Adventure at the Cross Roads

THE adventures that befell Don Quixote soon after he left the inn were enough to damp the ardour of any ordinary knight-errant.

When he had arrived at a spot where four cross roads met, he saw a party of merchants on their way to Murcia. Perceiving here the prospect of a new adventure, and resolved to imitate as much as possible the knightly prowess of which he had read in his books, he posted himself in the middle of the road and called upon the advancing strangers to halt and declare that there was no other damsel in the world to equal "the Empress of La Mancha, the peerless Dulcinea del Toboso."

After some parley, and dissatisfied with the replies given to his demands, the knight couched his lance, and rode so furiously at one of the merchants that had not Rozinante stumbled and fallen the man would have paid dearly for his raillery. As it was, Don Quixote was so encumbered with the weight of his armour that he could not rise.

At this one of the grooms, indignant at what he regarded as the insult offered to the merchant, his master, took the knight's lance, and, breaking it into pieces, belaboured him until he was tired out. At last the merchants pursued their journey, leaving Don Quixote powerless on the ground. Here he was found by a countryman, who, with no little difficulty, lifted Don Quixote upon his donkey, and, putting the knight's armour on the back of Rozinante, led him home.

While Don Quixote was recovering from his injuries, his friends made a bonfire of all the rubbishy books in his library, hoping, by removing the cause of his craziness, to restore the knight to his former healthy state of mind. But at the end of a fortnight Don Quixote prepared to go forth again.

This time he decided that he would have a squire. To this end he induced an honest but poor country labourer named Sancho Panza to go with him. He promised Sancho Panza that when opportunity offered he would make him the governor of some island, and this prospect so dazzled the fancy of the stolid countryman that he saddled his donkey, Dapple, and, joining the knight, mounted on Rozinante, the two made such haste that one morning by break of day they had travelled so far as to believe themselves out of reach of pursuit.

The next stories of Don Quixote begin on page 949.

WHAT THIS STORY TELLS US

WE read in these pages more about the microbes, the wonderful little creatures that live everywhere about us and are working all our lives either for us or against us. We learn here why we could not live without our microbe friends, and why men die through their microbe enemies. We learn, too, of one of the most wonderful things in the world—the way in which these little creatures, so tiny that the eye cannot see them, keep the earth from becoming piled up with dead things, by taking these dead things and preparing them for new life. We learn that the nearer we live to Nature the less harmful are the microbes to us, and we learn, too, one of the most serious things in the world—that if men would only work together in earnest to fight the microbe of consumption, as men once worked together to destroy the wolves, consumption would be quite stamped out of the earth.

OUR UNSEEN FRIENDS AND FOES

CONTINUED FROM PAGE 784

DIFFERENT kinds of microbes have different powers. Some will break down one kind of plant, some another. There are kinds of microbes in the earth which have special powers of making food material with the aid of the air which is found in the earth. Air contains a very valuable element, called nitrogen, which ordinary plants cannot use, and which we cannot use, though we breathe it into our blood along with the oxygen which we *do* use. But certain microbes can take this nitrogen and combine it with other elements so as to make compounds, which are perfect food materials.

Within the last year or two these special microbes have been purposely cultivated in the places where men of science work, and can be put in bottles and sent by post, and then sown, so to speak, in a field, so that, when the farmer comes afterwards to sow his wheat, these microbes will be ready there to provide the young wheat with the best food.

These particular microbes are specially fond of certain kinds of plants belonging to the tribe of peas which are not particularly useful in themselves; but the farmer knows that it is worth his while to grow these plants one year, so as to make the soil rich in food for his wheat in the next year. If he grows wheat every year, the soil will become exhausted of its food materials, and so farmers have long practised what is called the rotation of crops. It is, of course, a very serious matter, for the farmer and for the country, that the farmer cannot grow wheat every year. But now I think our discovery of microbes, and of what they do, is going to prove of the greatest value before long in actually making bread cheaper. It is hoped that, by using these special microbes in the way I have described, we may soon be able to grow wheat, year after year, in the same soil.

The dairyman should really be no less interested in microbes than the farmer should be, for they are of the utmost importance in all his work. Amongst them are included his best friends and his most dangerous enemies. If we realise that microbes are everywhere, we shall understand that they invade milk from the very moment that it is drawn—microbes of all kinds, useful and dangerous, from the air, from dust and from water. Now, milk is one of the best things in the world in which to grow microbes, and so those which get into it grow very quickly, for good or for evil. It is the duty of the dairyman to keep out of his milk, as long as it is in his charge, all dangerous microbes.

It is the duty of everyone who is in charge of milk to know that this, which is a perfect food for us, is also a perfect food for some of our most terrible enemies, such as the microbe

that causes consumption, and the microbe which kills tens of thousands of little babies every summer. We are only just beginning to learn in America how important this question is, and we shall soon have to follow the example of Denmark, and begin to take greater care of our milk.

THE MICROBES THAT GIVE US MEDICINE WHEN WE ARE ILL

But here we are talking especially about the natural and proper work of microbes. Now, there are quite a number of them which are, in a sense, natural in milk, and are indeed known as milk microbes. I do not say that they are found in milk when it is drawn, but they are certain to enter it, and they are indeed very useful in it.

These microbes exist in enormous numbers in cowsheds, and they always get into milk very soon after it is drawn. Now, the extraordinary thing about this is that as they grow and multiply in the milk they prevent other microbes, which might be bad for us, from growing there. In course of time they turn the milk sour, but sour milk is not bad for us, and, indeed, the microbes in sour milk, when they enter our bodies, help to protect us from other microbes which might do us harm. So they are really very good friends of ours, and nowadays, when people suffer from certain kinds of illness, they are purposely given sour milk in order to make them better. The microbes in sour milk help us to digest our food, and they prevent other microbes, which would hurt us, from multiplying in our food after we have swallowed it.

THE MICROBES THAT HELP US TO MAKE BUTTER AND CHEESE

But there is more to say than this. From milk we get cream, and from cream butter, but without the proper microbes of milk butter could not be made at all. It is the milk microbes which cause the cream to ripen, as it is called, so that butter can be made from it. That is one of the reasons why I said that some microbes were good friends of the dairyman.

The different flavour of different kinds of butter depends on the particular kind of microbe that ripened the cream from which the butter was made, and nowadays we can cultivate, quite easily, just those kinds of microbes which help us to make butter that has the kind of flavour which people like. As the microbes start the process of butter-making, they are called "starters," and in many parts of the world, though not yet in America, men of science supply the best kind of "starters" to farmers to ripen their cream with.

Just as we could not have butter without microbes, so we could not have cheese. All cheese, of course, is really made from milk, and the milk produced by any particular kind of animal, such as the cow, is the same all the world over. Yet there are dozens of different kinds of cheese, and their differences mostly depend upon the particular kind of microbe which has been used—whether people know it or not—in making the cheese. These, too, are now cultivated, and by sending tubes or bottles of them anywhere, you can enable the people there to make the particular kind of cheese usually made far away from them.

Besides butter and cheese, there are various special preparations of milk made in some parts of the world, some of which are very valuable when people are ill, since the body, even when ill, can use them easily as food. All these special preparations of milk owe their existence to microbes.

WE OWE OUR BOOTS AND SHOES TO OUR MICROBE FRIENDS

We owe our boots to microbes, too. Boots, you know, are made of leather, and all leather is made from the skins of animals by a process called tanning. But tanning would be impossible without microbes; so that we owe our boots to them as well as cheese and wine and cigars. Then they are used in preparing the dye called indigo, and in preparing many kinds of food for cattle, and we even owe some kinds of clothing to microbes, for without them it would hardly be possible to spin linen out of flax. Nor is this all.

Every great city has to deal with the problem how to dispose of its waste matter. The old way was—if the city were on a river—simply to pour the sewage into the river and let it poison the people of cities further down who drank the water of the river. I am afraid that a great deal of that goes on still, but it is dirty and nasty and selfish, and it destroys much human life.

We are slowly learning now, however, that there are ways of dealing with sewage which make it more or less harmless, and one of these ways is by using microbes. Now, it is the bad microbes in the sewage which make it so dangerous, and so the use of other microbes, to make the sewage harmless, or to get rid of it, is rather like the old principle expressed in the proverb, "Set a thief to catch a thief."

We see now that these tiniest of all living creatures play a great part in the world. But after all that has been said about wheat and butter and cheese and boots and linen, and so on, we must understand that all these useful things which microbes do are really quite unimportant compared with the first thing we talked about—the marvellous way in which they clear the earth of the bodies of all dead creatures, animal, vegetable, and even human, so as to make room for those who are now living and those who yet shall be; and, more than that, turn the stuff of which these millions of dead bodies are made into fresh, wholesome, and pure food material to nourish the life of the earth.

THROUGH THE WORK OF THE MICROBE THE LIFE OF THE PAST MAY LIVE AGAIN

You know what economy means? Literally, it means the "law of the house," by which everything is done in order, everything has its use, everything is put to the best purpose, and nothing is wasted. The work of microbes is the greatest instance I know of the economy of Nature—the law of her house. There are many lives which seem useless—the humble life in the sea, for instance, and thousands of kinds of humble life in the earth under our feet. But even though all these lives seem to come to nothing in themselves, yet their work is never wasted. There is no wholly wasted life in the world, for there are always microbes ready to take the dead creature's body and prepare it, so as to be useful for future life, which may be better and higher life.

Our own lives—even the lives of the greatest men and women—are built upon these humble foundations, and so, in a sense, we may say that through the work of microbes even the humblest living creatures of the past live again in us. So in this wonderful way life goes on climbing, and perhaps even we, who think so well of ourselves, will some day be looked upon as only the stepping-stones to something higher still; and if microbes can help to that end, so can we.

THE MICROBES THAT HAVE BECOME A TROUBLE AND PLAGUE TO MANKIND

Now, we must be quite fair, of course, in talking about microbes. Most people are very unfair, because they know nothing about all the useful and necessary work which microbes do, and talk about nothing but the harm which they do. But if that is unfair, so also would it be unfair if we should talk only about the good they do, and say nothing about the other side of the picture, for, unfortunately, there is another side.

All, or nearly all, the useful microbes we have been talking about live on dead matter; but, as we saw, there are a certain number of microbes who live, not on dead matter, but in and upon the bodies of creatures who are still alive. Probably all microbes began by living upon dead matter, but some of them learnt how to attack the bodies of very old or nearly dying plants, or animals, and so at last there were produced the present race of microbes, which invade the living bodies of higher creatures, and are a terrible scourge to mankind.

Plants and animals and men may all suffer in this respect; but it is very interesting for us to learn that, when creatures live wild, as we say, in their natural state, in the open air of heaven, and in the light, they suffer little from microbes.

PLANTS AND ANIMALS GROWING WILD ARE FREE FROM THE MICROBE PLAGUE

Wild animals and wild plants scarcely suffer at all. But when man takes various kinds of plants for his own purposes, and grows them in conditions which are not really natural, they are often attacked by microbes; and it is the same with animals. Oxen and cows suffer from consumption, for instance, but that is not when they are in their natural state, but when men take them and shut them up in badly ventilated and badly lit places. We must learn to stop this, for the cows can give their consumption to us by passing on microbes in their milk.

Just the same is the case with the monkeys and many other animals that

are kept in the Zoo. In their natural state, these creatures are not attacked by microbes; but if we take monkeys, which ought to be living in the open air amongst the trees, and shut them up in covered cages, then the microbes of consumption attack them, and they die.

A LESSON FOR OURSELVES THAT WE LEARN FROM THE MONKEYS

You would think that if you took a wild animal, such as a monkey, which naturally lives in a hot part of the world, and brought it to America, the most important thing to do would be to keep it warm. However, quite lately they have learnt at the zoos that the warmth does not matter very much, but that if they are kept in the fresh air, even though it is colder than they are accustomed to, the microbes of consumption will not attack them.

This is a lesson for us, and we are just beginning to learn it. If monkeys and tigers, and so on, were really meant to live in fresh air, with the sky as the roof over their heads, so also were men and women; and if we shut ourselves up, as we shut up cows and monkeys and tigers, microbes attack us, just as they attack them. The kinds of microbes which are useful to us, such as those which keep the earth sweet, those that help plants to grow, and so on, can thrive in the open air, and the light of day helps their work; but the dangerous microbes, and especially the microbe of consumption—which kills far more human beings every day than all the snakes and tigers in the world kill in a year—are themselves killed by open air and sunlight.

There are houses in America with rooms for people to live in where the windows are made so that they cannot open. There are thousands of rooms in many cities of the world which have no windows at all, and have to be lit artificially all the day. No human being should live in such a room; microbes are almost certain to catch him and kill him. It should be a crime to make such rooms.

ONE OF THE MOST TERRIBLE EVILS IN THE WORLD WHICH WE COULD STOP

The great truth is that in this case, as in so many others, men and women bring most of their evils upon themselves. We talk about microbes as if they were our deadly enemies, and had somehow come into the world just in order to hurt us. This is absolute nonsense. We could not live without them, and by far the greater number of them are unable to do us any injury. Those which hurt us most we bring upon ourselves.

I am especially thinking of the deadliest of them all—the microbe of consumption, a disease from which many American men and women have died since you began reading this part of our story. It is one of the most terrible evils in the world, but it is not necessary, and we could absolutely put an end to it in a few years if we all made up our minds that this was worth while. If we lived natural lives, and if we allowed those of our fellows who are less fortunate than we are to live natural lives, the microbes of consumption would not hurt us any more than they hurt other creatures which live natural lives. But we do things that are unnatural. The laws of Nature teach us that we were made to breathe fresh air; we defy those laws, and then we cry out against Nature for her cruelty in sending the microbe of consumption to kill us.

HOW THE MICROBES WARN US TO TAKE CARE OF OURSELVES

By far the greater number of all human diseases are caused by the attack of microbes, the tiniest, humblest, and very nearly the oldest of all living things. Considering the murder they do every day, no wonder we are afraid of them; no wonder most of us think they are all evil. But the astonishing thing is that, whilst human beings almost always die of some disease—which is nearly always caused by microbes—yet animals do not die of disease except in comparatively rare cases. On the whole, we may say that microbes do not attack them, but only attack us. So soon, however, as we put animals or plants into conditions that are not natural, as we foolishly put ourselves, then they suffer just as we do and for the same reason.

Before very long we shall learn from this striking lesson that we cannot do without air and sunlight; that we must not be packed too closely together; and that, if we obey these laws of our own lives, then the lives of other living creatures, such as microbes, will scarcely injure us. If we can save

the monkeys in the cages from the microbes of consumption by keeping them in fresh air, we can also save each other in exactly the same way.

One of the most important of these microbes is not usually called a microbe, but it might quite well be so called, for it is a close relative of microbes and lives in the same way. There is no reason why it should be an enemy.

THE MICROBE THAT HELPS TO DRIVE THE MOTOR-CARS

This is the yeast plant, which turns sugar into alcohol and the gas called carbonic acid. We use it every day in making bread. The alcohol is blown away as a gas and the carbonic acid forms in the flour and makes the bread rise.

But we also use the yeast plant to get the alcohol that it makes. This also is a very useful substance; it is used in hundreds of arts and industries; it is splendid for cleaning things and for preserving them; it burns beautifully and makes a splendid fuel; it is, perhaps, the cheapest and most easily made of all fuels for many purposes. It is cheaper than gasoline, which is now used for motor-cars, and some people expect that before long alcohol will be used to drive motor-cars, and also to work engines. So, if we had the sense to know how to use alcohol in useful ways, the tiny yeast plant which produces it would be among the best friends of man.

But, as you know, men drink alcohol. Now, this substance is a poison to all living creatures, without exception, men or animals or plants. It is even a poison to the yeast plant that makes it, and when the amount of alcohol in the sugar, which the yeast plant is feeding upon and changing, reaches a not very high proportion, the yeast plant is killed. So, if the process is wanted to go on, the alcohol has to be taken away as it is made.

HOW ALCOHOL MAKES THE BED OF DISEASE IN EVERY LIVING THING

Alcohol is of no use to our bodies, but in time will cause disease in every part of them, especially the brain, which is the most important part of us. It also prevents us from protecting ourselves against other microbes, and this it does in some very interesting ways, which we shall see later.

Most especially is it the great friend and ally of our great enemy, the microbe of consumption, for which it prepares the way by making our bodies unable to resist it.

You can usually find the microbe of consumption in abundance in liquor-saloons, because many people who suffer from consumption spend much of their time in such places, and there the microbe attacks new people who are made ready for it by alcohol. Especially does this apply to children, and there are far too many little children in America whose playground now is on a dirty floor, covered with microbes. But men are fighting to stop this, and are going to stop it soon.

Now, a word or two about the microbe of consumption. It was found only a quarter of a century ago by a great German called Koch, who is still alive, and who took up the work of the Frenchman, Pasteur—the first man to understand and tell us about microbes. We know that many thousand people are killed by the microbe of consumption in America every year. All over the world, wherever men are crowded together, this microbe destroys them; but now that we have found it out we shall probably make an end of consumption, especially as we are beginning to attack its great friend, alcohol, made by the yeast plant.

THE MICROBES THAT DO MORE MISCHIEF THAN THE WOLVES

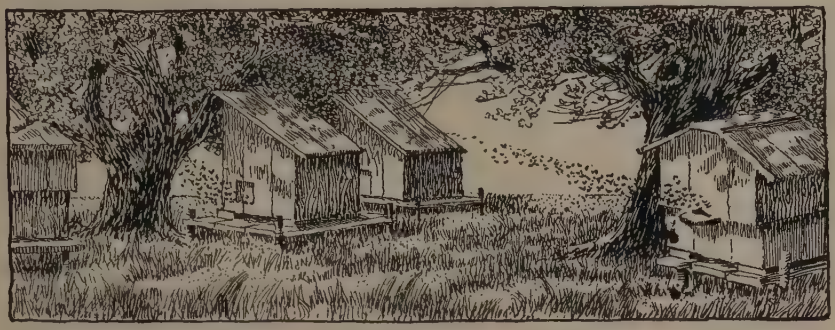
Probably the microbe of consumption is one of those which can scarcely live at all except in the bodies of other living creatures, such as ourselves, and so, when we prevent it from attacking us, it will no doubt die out altogether. We shall destroy it just as our ancestors destroyed the wolves which used to live in forests and to do much harm—though never a thousandth part of the harm that the microbe of consumption does—but which they made up their minds to destroy.

Of course, there are many other microbes which hurt us, but I cannot say any more about them now, and though I have ended by talking about the bad side of microbes, I want you to understand that that is largely our own fault, and that, though some microbes kill us, yet without microbes, as a whole, we could not live at all.

The next part of this is on page 1003.

ONE OF THE WONDERS OF THE WORLD

This tremendous figure of a man is called the Colossus of Rhodes, and was made 300 years before Jesus was born. There were great statues on the island of Rhodes, but this was the greatest. It was made in honour of the sun, which the people worshipped. One finger of this statue was longer than a man, and some writers say that it was mounted on huge towers like these at the entrance to the harbour, and looked out upon the sea for 500 years. Then an earthquake destroyed it.



WHAT MAKES A BEE HUM?

CONTINUED FROM PAGE 780

THE humming of the bee and of so many other insects is not like the murmur of the sea-shell, which picks up sound like a telephone, but is made by the bee itself. You have never heard a bee hum when it was crawling—nor any other insect. This tells us what we might have guessed, that the bee's humming is made by the movement of its wings when it flies. The noise is not made by its voice-box, as when you sing, for the bee has not got a voice-box. But its wings move very quickly—a bird would "hum" when flying if its wings moved quickly enough—and as they move to and fro, or *vibrate*, or tremble, they set the air moving, too, and you know already that waves in the air make sound when we hear them.

If the waves are too slow, as when you wave a stick in the air, or when a bird flaps its wings, we hear nothing. If they are too fast, as they are in the case of some insects, perhaps, and in other cases, like the scream of the bat, we cannot hear them; or, to take the bat, some people can hear them, but many, and especially old people, cannot. Thus there are many sounds we cannot hear, as there are many colours we cannot see. But the vibrations in the air made by the bee's wings are of a rate that is within the range of our hearing—if the bee is near enough—and so we hear a humming. I am sure you will guess that that word, like "murmur," is made to imitate the sound of which it is the name.

CAN WE HEAR A NOISE LIKE WAVES IN A SEA-SHELL?

I am afraid, said the Wise Man, that the pretty idea in this question is only just a poet's fancy, and nothing more. The truth is, we only imagine a likeness between the sound of the shell and the sound of the sea; though I quite admit that it is easy to imagine, and that we may forgive the poet who said that the shell is "Murmurous still of its nativity"—its place of birth. Murmur is a good word for this, made on purpose to imitate the sound.

Really, then, the shell is one of those things which can pick up and make stronger certain kinds of sounds. The wooden part of a violin does this: if you take it away and play on the strings without it they make a feeble, thin, unpleasant tone. These things *that make sound resound* are called *resonators*. The body of the violin is one, the sounding-board above the pulpit in some churches is another, and a shell is a third.

WHAT ARE THE SOUNDS WHICH THE SHELL PICKS UP?

"The shell," you may say, "makes a murmur even when everything is quite quiet; surely the sound is made within itself—it murmurs still the

sounds of its birthplace." The answer is that really it is never *quite* quiet, and that the shell picks up sounds so slight that we do not hear them at all without the shell. The other day this was shown in a new way. A clever man built a sound-proof room. People inside it heard their own hearts beating, and so on. But there were cut out of the room all the tiny noises that usually go on, and when a shell was held to the ear nothing at all could be heard. The shell is only a telephone, and if no sounds come for it to resound, it is silent. But the beauty of the poet's idea remains; and it is true as a picture of what happens with men and women, and their remembrance of the places and people of their childhood.

DO PEOPLE LIVE ON THE MOON?

Well, we have only seen one side of the moon because, as it goes round the earth, it turns slowly on itself, so as always to keep the same side turned towards us. But we are all quite sure that there are no people on the moon, either on this side of it or on the other side, which we have never seen. People could not live on the moon because the moon has no air and no water. Even if people could live there without air or water, they would probably be burnt to death in the daytime, having no air to protect them from the heat of the sun, and they would be frozen to death at night, having no air to keep in the sun's heat. There are certainly no people on the moon, and never were.

But possibly at one time there may have been humble forms of plant life on the moon, and some people suppose that there may be a little of this even now, for it is just possible that there may be a very tiny amount of air and water still left at the bottom of some of the deepest valleys in the moon. If there were a building on the moon as big as the Capitol at Washington, we should be able to see it through our biggest telescope, but there is not the slightest sign that intelligent beings have ever made a mark of any kind on the moon.

WHAT ARE THE STARS MADE OF?

Not very long ago, a very great thinker declared that this great question you ask me was one which men would never be able to answer, however long they thought and however hard they worked. Our telescopes could never tells us; the biggest telescope that could ever be made would never tell us

It would only make the star look nearer and brighter, but would tell us no more what the star is made of than our eyes can tell us without a telescope. But now we have a wonderful instrument by which we can study the kind of light that is given out by any star that we can see. And since we find that the light of the stars, thus studied, is exactly the same as the light given out by things we know on the earth when they are made hot, we now know that *those same things* are found in the stars.

So I can answer your question, and the answer is that the same kind of stuff of which this paper, and your eyes, and my ink and pen are made are to be found in the stars. The stars are made of the very same kinds of stuff as the earth is made of. Of course, all the stars are not the same. Even with our own eyes we can see that some are redder and some whiter than others. Some have much more oxygen in them, and some less, for instance; but the point is that it is oxygen, the very same stuff as we breathe at this moment.

WHY DO THE STARS TWINKLE?

This sounds a very much easier question than the last, but we are not yet quite certain of the answer. Of course, you know that it is stars that twinkle, and not the other wonderful things looking like stars, which are called planets, and which, like the earth, belong to the sun's family.

The planets shine by the light of the sun, which they throw back, or reflect, from themselves, as the moon does, and, like the moon, they shine steadily. But the light of the stars is made by themselves, and comes over immense distances to us, so long that, as we have already seen, the light by which we see the nearest star left it something like four years ago.

It is likely that this light interferes with itself as it comes, so that it seems to come in little beats, and people who have studied this think that it is much the same as what sometimes happens with the piano or an organ when the sound seems to get louder, and then less

loud, backwards and forwards. In the study of sound this is called a "beat," and it is probable that the twinkling of the stars is really the same kind of thing. It may be that the air has something to do with disturbing the light, and that perhaps starlight is more affected by the air than the sunlight by which we see the moon and the planets.

DID FLOWERS ONCE ALL GROW WILD?

Certainly all flowers did once grow wild, and all animals, too. There are certain kinds of flowers and animals which men have, so to speak, made by choosing the kind of thing they wanted and leaving the rest, and so gradually getting such things as the garden rose, the pouter pigeon, and so on. These are what we call *cultivated* varieties, but all of them, even the most curious and newest orchid, or pigeon, or breed of dog, have been made from wild or natural forms; and, of course, before man started doing this, all flowers, all plants, all animals, were wild. Even now, if we are careless, our garden plants will return sometimes more or less completely to their natural state, and so will domestic animals. On the other hand, cultivated flowers may escape from a garden, as we say, their seeds being carried by insects or the wind, and may then appear to have grown wild. There is no end to what we might do by cultivating plants and flowers. Men used to try only to make beautiful forms, but lately they have tried to make useful ones, and have succeeded, especially in making from old kinds of wheat new kinds which are far more valuable for human food.

WHY DOES A NOISE BREAK A WINDOW?

The answer to your question is easy if you know what a noise is. It is an irregular wave in the air—which is a real thing, and has weight and power, remember. A wave of air may break a window exactly as the wave in the sea will break a breakwater, though, as the name tells us, the breakwater will break the wave, as long as that wave is not too strong.

If you think a minute, you will see that every time a noise gets through a shut window it shakes the window. If the noise is coming in from the street, the air outside is thrown into waves which pass through it until they strike the window, and shake it; then the window shakes the air inside the room in exactly the same way as the air outside shook it, only perhaps not quite so strongly. And so the noise reaches you, just as if you had heard it outside, only not quite so loud. Well, plainly, the noise has only to be loud enough—that is to say, the waves in the air have only to be big enough—to shake the window more than it can stand, and then it breaks. Now, I said that air is a real thing which has weight and power, and so the truth is that when you ask me why does a noise break a window you might just as well ask me why does a cricket-ball break a window!

WHY DOES THE KETTLE SING?

Everything that sings, sings really for the same reason—because it is set vibrating. That difficult word simply means trembling. When you sing or speak you make the little cords in your throat tremble, and when a kettle sings we may be sure that something is vibrating somewhere. This sets the air round it vibrating, and if it vibrates quickly enough we can hear it sing. If you only had a stick in your hand, and could turn it quickly enough in the air, you could make the stick sing.

Now, kettles do not always sing quite the same tune, and that depends upon a number of things; but at any rate we can understand that, as the water gets hot and begins to boil, it is turned into water-gas, or water-vapour, and it has to force its way out through the spout, and past the lid of the kettle. As it does this it sets various parts of the kettle trembling, and so the air is made to tremble, and so the drum-head, or window, in your ear is made to tremble, and *somehow* your brain feels this, and you say the kettle is singing.

It is the pressure of the gas coming out that sets the kettle trembling. When you speak or sing you nearly close your throat, and then squeeze the air in your lungs through the small opening; and it is the pressure of the gas that sets your vocal cords trembling. So the kettle sings just as you do.

WHY DOES THE MILK TURN SOUR?

If we could prevent anything from getting into milk from the moment the cow is milked, it would never turn sour, and perhaps it is a pity that we cannot do this. But what happens is that all

sorts of things get into the milk. Some of these are just specks of dirt which we can see, and these we ought always to be able to keep out, but other things which get into milk, falling into it from the air or from the sides of the vessels it is put into, cannot be seen in the ordinary way, for they are so very small.

These are tiny little living things called microbes, and it is because they are alive that they are so important. All kinds of these get into milk, but there is one kind with a special name, meaning the microbe of milk, which is always to be found in milk.

DOES SOUR MILK DO US HARM?

Fortunately, the milk microbe does not much hurt anyone who drinks the milk. It finds milk a very nice food, as we do, and it is specially fond of the sugar which it finds in milk. Out of this sugar it makes an acid, and it is when this has been made in the milk that we call the milk sour. Such milk, if nothing worse has happened in it, is really almost as good as fresh milk, but the trouble is that, when milk has been turned sour in this way, other microbes—some of which are very bad for us—are almost sure to have grown in it, too.

It is quite easy to prove that these special microbes turn the milk sour, for if we add to the milk something which kills them, or—which is very much better—if we boil the milk, and kill them in that way, and if then we keep the milk in a vessel which has been scalded with boiling water, and if we keep the milk from the air, it will not turn sour. Milk should never be exposed to the air, for whenever it is these little microbes will drop into it.

DOES A WORM BREATHE UNDERGROUND?

Every living thing breathes, whether in earth, or on the earth, or in the sky, or in water. If it cannot get air it dies. The worm really has no trouble at all, for there is plenty of air and to spare in the earth anywhere near the surface, and it just helps itself. Of course, if you dig deeply into the earth, there will not be enough air for a thing like a worm, which needs a good deal; and you will find only living creatures, like some microbes, or tiny plants, which need very little air. Further down still you will find no living things at all. There is no life at all in the inside of the earth.

DO SEEDS BREATHE?

Seeds are no exception to the rule that every living thing must breathe. Nor are eggs. Perhaps you have never thought that an egg is alive? But if you varnish an egg, so that no air can get through the shell, it will die, and no chicken will come out of it. Now, the seed gets its air, or, rather, its oxygen from the air, just as the worm does. So you must not plant the seed too deeply, or it will not get enough air, and then it will die. You may wonder that a seed should breathe, but that is because we always think of breathing as if the only kind of it were our breathing, with ribs and lungs.

The air in the earth, which enables plants to grow from seeds and trees from acorns, and keeps alive worms and insects and many microbes, is known as *ground-air*, and as its warmth depends on the warmth of the earth, it is very different at different times of the year. That is one reason why certain illnesses attack us at certain times of the year—because the warmth of the ground-air is just right for the growth of the microbes that cause those illnesses. Remember, there is air in the earth as there is in water.

HOW DOES A BALLOON KEEP UP?

This question is really the same in its explanation as the question why does a stick float. I want to remind you again that the air is a real thing. If there were no air, the balloon would drop like a stone, just as, if the water all disappeared from the sea, the fishes would drop to the bottom. Things float in the sea, or on the surface of it, because the amount of stuff in the space they occupy is less than the amount of stuff in the same space of water. It is a question of density, which we read about on page 542. The less dense thing always tends to lie above the more dense, and if the things in question are gases or liquids, they always will follow this rule. If you pour hot and cold water into a bath or into a tumbler, the hot water will lie at the top and the cold at the bottom, because water is less dense, and therefore less heavy, when it is hot than when it is cold. Gases behave in exactly the same way. Hot

A ROADWAY CUT THROUGH A TREE

There are trees that live to be many hundreds of years old; there are trees so huge that a carriage and four horses can drive through them. This is one of them. It is one of the largest trees on the face of the earth, standing in Mariposa Grove, California. It is called the Wawona Tree, and is so enormous that, as this picture shows, a road has been cut through it, and a horse and cart can pass through it with plenty of room to spare. The tree is 28 feet across.

air behaves in the midst of cold air just as hot water behaves with cold water —it goes upwards.

Now, if you put the hot air into something very light, the hot air, as it goes upwards, will take that something with it. The first balloons were made in this way. Two Frenchmen, brothers, made balloons of silk and linen and filled them with hot air and smoke, and after making balloons which carried animals, they persuaded some men to be carried in this way. You understand that this was simply because hot air is less dense than cold air, and therefore lighter.

WHAT MAKES THE BALLOON GO?

But, of course, hot air gets cold, and then your balloon will come down. So we ought to fill our balloon, if possible, with some gas or other which, even when it gets as cold as the air around it, is still lighter than the air. Nowadays balloons are filled with such a gas. Its name is hydrogen, and it is extremely light; indeed, it is quite the lightest thing we know. Oxygen, for instance, is sixteen times as heavy, and nitrogen fourteen times as heavy, and as the air is a mixture of these, hydrogen, if let loose in the air, will fly upwards at once, and, if you have enough of it, it will carry not only a covering to keep it together, but also many people in a car hung from the covering. In another part of this book we read about the gas called hydrogen. The interesting thing for us now is simply that it is so very light, and therefore is more useful than anything else for filling balloons with.

WHERE DOES THE SNAIL FIND ITS SHELL?

The answer to this is that the snail makes its shell from its own skin. The same is true of the shell of the oyster, or that of the lobster. Our own skins, we know, can make things which are fairly hard, such as our nails; and it is also true that the hardest things in our bodies, our teeth, which are, or should be, even harder than the shell of the snail, are really made from our skin, which has been, so to speak, turned into our mouths so as to line them. There are really few things more wonderful than the way in which quite soft, living creatures, mostly made of water, are able to make the hardest things, like teeth and wood and shells and pearl, and so on. If we look very carefully at the skin of creatures like the snail, we can see how its outside cells are specially made so that they can gradually get harder and harder, until they cannot be called skin at all, but are really nothing else than shell. We can watch very much the same thing if we look at the cells at the base of our nails or the cells that make the horns of animals, and see how the soft skin is gradually changed.

HOW DO FLIES WALK ON THE CEILING?

Well, said the Wise Man, you might have said why can flies walk upside down, which sounds more wonderful still. The reason, no doubt, is that the fly's feet, besides being just the least little bit sticky, are made like suckers, and hold on to whatever the fly walks upon, just as a boy's sucker will hold on to a stone, so that he can lift the stone by means of it. Then, of course, we have to remember that the fly's body itself is very lightly made, just as a bird's body is, because both are meant to fly; and this makes it easier for a very little force to prevent the fly from falling even when it is upside down.

WHY DO NOT SPIDERS GET CAUGHT IN THEIR OWN WEBS?

It is the strength of the spider that prevents him from getting caught in his web, which is only made for catching creatures much weaker than himself. We know for certain that the spider can cut his web when he pleases, so that there is no fear of his getting caught in it. The spider is a wonderfully clever animal, but he is not brave. If an insect that is too big for his taste comes against his web, he will sit quite still in one corner and never move until it goes away, and sometimes he is so frightened that he simply cuts his web rather than get into difficulties with something that is more likely to eat him than the other way about. In this he is cleverer than some men, who make nets to catch other people and get caught in them themselves. In proportion to his size, the spider is a very strong animal, and it is really wonderful that he can cut his own web, for they say that in proportion to its weight it is the strongest thing known—stronger than steel.

HOW DO BIRDS KNOW HOW TO BUILD THEIR NESTS?

If you had asked me instead how do spiders know how to make their

webs, the answer would have been just the same as the answer to this question; and, though we can tell you something about it, yet no one has really explained how it is that animals are able to do these wonderful things. It is by the power of what we call instinct. We human beings have very little instinct; we have to learn for ourselves almost everything that we do. We cannot write or read instinctively, and if we are to learn well we must practise, and we must have help from older people to teach us. Only we have this advantage, that there is *no limit* to what we can learn.

The instinct of animals, however, shown in the spider's web or the bird's nest, or a thousand other things, is quite different. There is no learning at all. Many animals have to do a most difficult thing only once in their whole lives, and after doing it they die; and we know for certain that they have never seen any other animal do it. They have never learnt, they have never practised, and yet they do it perfectly. That is the power of instinct; but the weakness of it is that it can only do what it is made to do, and it is for this reason that intelligence is so vastly superior to the best instinct. You will say that I have told you a lot about instinct, but nothing about where it comes from; and that is quite true, because no one knows.

WHY CANNOT FISHES LIVE ON LAND?

The answer to this is curious. Every living thing must have air or die. The fish comes out of the water, where there is very little air, into the air itself, and there it dies for lack of air. It is drowned on land for lack of air, and dies of what is called suffocation, just as you or I would be drowned in the water.

But why on earth—in this case you may be excused for saying "on earth"—cannot the fish help itself to the air around it when it is put on earth? Why should it starve in the midst of plenty, like a rich man who has something the matter inside him? The reason is, that in order to breathe air you must have lungs, or something like lungs, and the fish has none; whilst in order to get the air which is dissolved in water, which the fish does, you must have something quite different from lungs, which are called gills. The fish has no lungs, but only gills. We have no gills, but only lungs. Therefore, we die in the water and the fish dies out of it. If an animal had both gills and lungs, then it would be able to get air from the air or to get the air which is in water, as it pleased; and it could live both on the land and in the sea.

HOW IS A STONE MADE?

Stones are really pieces of broken rock. By the side of the road you can see stones being made with a hammer. These are sharp, as they have been rudely broken.

But rocks are broken up in many other ways. Even the life in the soil on a cliff, for instance, may gradually break up the surface of the rock. If the pieces rub against each other, and are open to the wind and the rain, then they get rounded and dull; but if you take many of these stones and break them, you will find the unchanged rock inside them, often beautifully smooth and bright. There are other kinds of stones which are quite soft. Those we have been speaking of are made of real rock which long ages ago was made under the action of great heat. But you may pick up sometimes a soft stone which you can quite easily rub away—a piece of soft sandstone, which is really very much the same as the sand on the seashore; and, indeed, when it is rubbed down, what it makes is very much the same as sand.

WHY DOES COAL BURN AND NOT A STONE?

The simple answer to this is that stone is burnt already and cannot be burnt twice; but, of course, that answer wants explaining. What happens when a thing burns is that it combines with the oxygen of the air. When it has taken up all the oxygen that it possibly can and has combined with it, then it is completely burnt, and can burn no more.

We watch a candle, let us say, burning, and we are deceived because we do not see the result of the burning. The result in the case of the candle is a number of gases which we do not notice, real though they be; but when various other things are burnt the result is not a gas at all, but sometimes a liquid and sometimes a solid.

When the gas hydrogen is burnt or combined with oxygen, it forms water, which is usually liquid. When the element silicon is burnt or combined with oxygen, it makes a solid, and most rocks and sand are made of this. An ordinary stone or sand is really silicon which is already burnt, and so can be burnt no more. But coal is made mainly of carbon which is not yet burnt, and so it can be burnt. Burnt carbon—that is to say, carbon combined with oxygen—makes the gas called carbonic acid, and that gas cannot be burnt any more than a stone can, and for the same reason. Both are burnt already.

HOW IS IT THAT ASBESTOS DOES NOT BURN?

I have put this question with the last, said the Wise Man, because the answer to it is really the same. Asbestos is already burnt, like stone or sand, and can be burnt no more. It is also very difficult to melt, and will not melt with the heat of an ordinary flame; and so it can be used for many purposes—to line safes, for gas-stoves, and so on. The very work is simply taken from the Greek, and means "unburnable." Of course, both in this case and in the case of stone and sand, we cannot doubt that long ages ago all these things were made by being burnt or combined with oxygen when the earth was a very different place from what it is now. If you consider how much of the stuff in the crust of the earth is already burnt—that is to say, already combined with oxygen—if you consider that all water is already burnt, and if you remember how much oxygen there is in the air even yet, you will understand how it is that about half of all the stuff we know consists of oxygen.

WHAT IS SMOKE MADE OF?

Smoke is the result of imperfect burning. Most of the things from which we get so much smoke—like coal—if they were properly burnt, would form nothing but gases, which we could not see, and which would very soon fly away and do no harm to anybody. But in order to burn coal properly some trouble and care are required. When we burn coal in an ordinary fire, we do not supply enough air to it. We put the fresh coal on at the top instead of at the bottom, as we should, and so we only partly burn the coal, and small specks of it, unburnt, are carried up in the draught, and make smoke. The chief stuff in smoke is simply coal, in specks of various sizes. But the trouble is that a great deal of oily stuff comes out of the coal, and covers the specks of it in smoke, so that these stick to things. We all do wrong in this respect in our fires at home, and the time will come when we shall make our fireplaces differently, so that we can burn our coal in a better way.

At present the smoke makes black fogs in many cities, and cuts off a great quantity of the daylight by which we live, besides making everything dirty, destroying plants and trees, and filling our lungs with dirt which we never get rid of. There are few things about which we are more careless than smoke, and if we had sense enough we should stop making it, even if it were only for the reason that all the stuff in smoke might be burnt, and that so in making smoke we waste a great deal of our fuel.

WHY DO BIRDS NOT FALL TO THE GROUND?

We know, of course, that there is such a thing as the air, a great ocean just as real as the ocean of water; and the flying of the bird is really very like the swimming of the fish. But, of course, if a bird stops flying it will drop, for its body is heavier than the air. Everyone knows this who has shot birds for fun; but I hope you have never done that. Though the bird's body is heavier than the air, yet it is very light, and is most beautifully made, so as to be as light as possible. There are great spaces in its body which are filled with air, and its bones are light though very strong.

Still, though this helps the bird, of course, yet all the same its body is heavier than the air, and it will fall unless it uses its wings. The bird knows this, and sometimes it wants to fall quickly. It folds its wings and simply drops as you or I would if we fell out of a balloon. The strongest muscles in the bird's body are those which press the wing downwards, and if it uses them quickly enough, this keeps its body up or even raises it. When we swim we do what is really just the same thing, though it is not nearly such hard work to swim, really,

as it is to fly. No machine that man has ever made is as clever as a bird for flying, because there is no machine in the world that can do so much work as a muscle in proportion to its weight. If only man did not have to take with him up into the air the engine that gives him his power, then he could make flying machines easily enough.

WHAT MAKES A KITE FLY?

The case of the kite proves to us that the air has a great power of holding things up, since the kite has no wings, and yet it does not fall. The air supports it. If you took all the stuff of which a kite is made and rolled it into a tight ball, it would drop like a stone.

So it is not that the kite is made of something lighter than the air. A balloon flies, we know, because it is filled with something lighter than air, but the kite has no light gas inside it, and yet it does not fall. The reason is that it is spread out as wide as can possibly be, so that it may have a large surface for the air to support it. But, of course, if there were no air at all the kite would drop at once, just as the bird would, whether it were flying or not. Neither the kite nor the bird could rise or swim in nothing. Now, the Latin word meaning empty is *vacuus*, and a place that is quite empty, even of air, is called a *vacuum*. Nothing can soar in a vacuum.

HOW CAN WE TELL THE AGE OF A TREE?

In the case of some trees, said the Wise Man, you can only guess at this, but in the case of many you can tell exactly, because the tree makes a fresh growth every year under the bark, and as this differs rather in the earlier part of the year from the kind of wood which is made later, you can easily distinguish between one year's growth and the next. So when the tree is cut across—but that, of course, means killing it—you find that it shows a number of rings, one inside the other, and each of these rings corresponds to a year of the tree's life.

In the case of a man or a woman, the number of years he or she has lived need not make any difference or leave any mark. Some people are far younger at eighty than other people at thirty, for we do not live by the changing seasons of the year. But all plants do this in some degree or other, and thus they show the marks of their age. Another way in which trees differ from us is that, as long as they are alive, they go on growing, whilst we, of course, are quite different, and after the earlier part of our lives is past we never grow any more. Some trees live to be many hundreds of years old, even 1,000 years or more.

WHY DOES THE BARK GROW ON A TREE?

If the bark did not grow on the tree, the tree would not grow. The bark is a necessary part of the tree, and if you strip the bark off you will kill the tree. In the first place, the bark does one or two things which are useful but not very important. The outside of it is usually pretty tough, and has become more or less dead (like the outside of our skin) so that things do not hurt it, and it protects the living part of the tree inside. Often many animals and humble plants live on the outside of trees without doing them any harm, but that is really a very small thing. The *inside* of the bark is the most living part of the tree, we may say; not only so, but it actually makes the tree. All the growth of the tree in thickness is due to the making of the wood, and it is the bark, the soft living part of the inside of the bark, that has made all the hardest wood of the biggest and hardest tree-trunk. Also, there are channels in the bark through which the sap of the tree, its food and water, run, in much the same way as the blood runs in our own blood-vessels.

WHAT ARE CLOUDS MADE OF?

One of the reasons why we know that there is no water, or scarcely any water, on the moon is that we never see the slightest hint of a cloud when we look at it. If there were people on the moon looking at the earth, they would constantly be finding that the face of the earth was hidden from them by clouds. One of the things which we are studying now in the wonderful planet Mars is as to whether there are any clouds to be seen there, because, if there were, that would help to show that there is water on Mars. So, what I have said answers your question, does it not? Clouds are made of water. But there is water in the air everywhere. There is a quantity of it in the air of the room where you are reading this, or in the air around you—if you are so wise as to be reading in the

open air. Yet this does not make a cloud. The reason is that most of the water in the air is in the form of a gas; but the water of clouds is wet water—indeed, a cloud is made of many drops of water, which, when they fall, we call drops of rain. Men who study these things are now beginning to learn how it is that sometimes these drops stay in the cloud, and sometimes they fall and make rain. The water has come from the seas and great lakes, and has been drawn up by the sun.

HOW DOES A TRAIN KEEP ON THE RAILS?

We all think we know the answer to this question, said the Wise Man, and we are nearly all wrong. If you look at the wheels of a train you will see that they have a rim, or flange, on the inside, and people think that this keeps the train on the rails. If that was all there were, not a single train in America would ever reach the end of its journey. The real reason is in the way the wheel is made. These pictures will show you. The first shows you the sort of wheel that you would expect; the second shows the wheel as it really is. The wheel where it runs on the rail is cut slantways. If it were cut flat, so as just to fit on the rail, no flange would ever keep the train on the rails. But the wheel cut slantways does what is wanted, because it is harder work for the wheel to ride on the part near the flange than on the part away from the flange.

That is to say, it is easier for the wheel to run where it is smallest, and the wheel is made smallest on the outside edge, so that both wheels press *outwards*, as it were. This means that if one wheel is pressing too far outwards the other is pressing *the other way*, and so the two wheels keep each other right. The wheel is really made up of several wheels together, the outer being smaller than the inner, and it costs the engine less work if the train rides on the smallest wheels—that is, if the outer part of the wheel-edge rides on the rail. Moving things always do the least work they can; that is to say, they always take the path of least trouble—like most little boys and girls, and grown people, too.

WHY A TRAIN KEEPS ON THE RAILS

Wrong way

A train keeps on the lines because the wheel is made so that it rests slantways. The cars in the picture are the kind used in Europe.

Right way

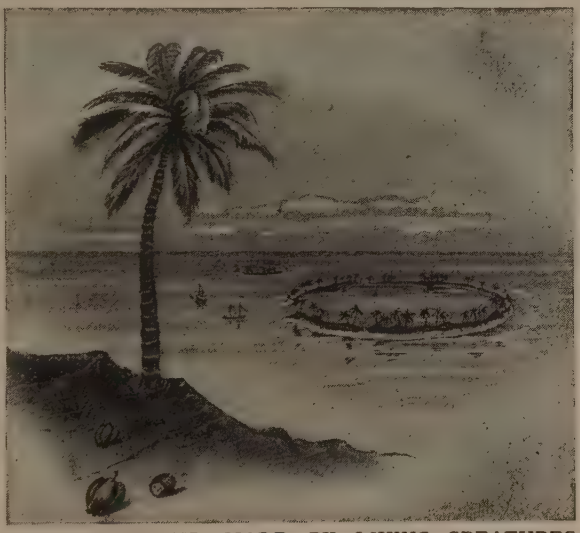
WHAT CAUSES A FOG?

People are very careless in the way they use the word fog, and we really need a new word. There is a kind of fog which is only a dense mist, and it is really just the same as a cloud, only it is near the earth, and is wider spread. When you go up through a cloud in a balloon, it is just like going through a thick mist. These fogs are, of course, very common at sea, for the obvious reason that they are made of water, and there is plenty of water there to make them of. But they are perfectly clean, and they probably do not injure our bodies at all. The real danger about them is that, at sea, they may prevent ships from seeing one another, and so they may strike each other. But the kind of fog seen in some cities is a very different thing; it is mostly made of smoke, and someone has very well suggested that we should call it not "fog" but "smog," in order to remind ourselves that it is made of smoke. Now, in certain states of the air, and especially when the air is warm enough, smoke rises high into the sky, and is blown away and does not do very much harm, though, at the very least, wherever there is smoke there is waste. But often when the air is cold

the smoke gathers and settles in the form of a fog, or, rather, a "smog." This interrupts the traffic; it makes everything dirty; it eats away the surface of most beautiful buildings—especially in a great city like London, where there is a great deal of fog during the winter—and it makes thousands of people ill. Some day men will wonder that we were so silly as to allow this.

HOW IS A CORAL ISLAND MADE?

Over thousands of miles in the Pacific Ocean there are groups of low, ring-shaped islands, like the two shown in the picture, and for a long time men have wondered how they were made. We know now that they are actually made of the hard parts of the bodies of countless millions of tiny living creatures belonging to the animal world. The stuff we call coral is really made of the skeletons of these little animals, all joined together. Coral islands have gradually grown upwards to the surface from the bottom of the sea, as a result of the life and death of these tiny animals. They only live in water, and so when the coral ring comes to the surface and makes a coral island it stops growing. The tiny animals on the outside of the coral colony get most food, and so grow more quickly and their bodies are piled up faster than those on the inside. So the ring is formed; and often a few cocoanut trees find a footing upon it, as we see in the picture, the seeds of the trees being carried to the island by the wind. We can only guess how many ages it takes for a coral island to grow from the bottom of the ocean till it reaches the surface. Most of what we know about coral islands was found out by the English scientist, Darwin, and by Dana, an American.



A CORAL ISLAND MADE BY LIVING CREATURES in the way described on this page

WHY DOES A GALE BLOW GREAT TREES OVER AND LEAVE RUSHES STANDING?

Well, you might add, said the Wise Man, not only rushes, but also some kinds of trees, like the willow, which bend before the gale just as rushes do. The reason depends upon the difference in the wood of various trees; some are elastic, and some are not. The tree which is not elastic, but rigid, like the oak, will stand unmoved, so far as its trunk is concerned, in a very strong wind, though far less wind will make the rush or the willow bend, because it is nothing like so strong. But if the wind becomes a great gale the oak will break; the willow and the rush will bend as they did in much less wind, and when the gale is over they will come upright again because they are elastic. If you strike a piece of string with a stick it will bend, but will not break; if you strike a thin stick with a thicker stick the thin stick will break. That is what happens in a gale of wind.

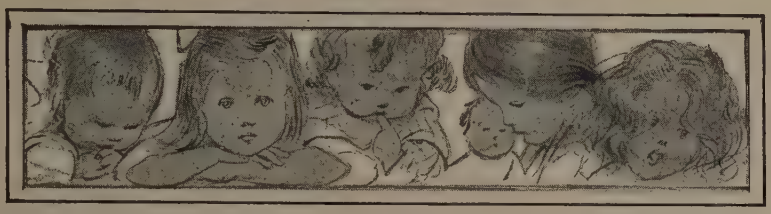
There is a very good lesson for us here. There are people who are like the oak; they are strong and can stand a great deal, but they are rigid, and do not know when to yield or give in, and the time will come when they will, so to speak, break, whilst other people who are less strong will recover. But the wisest people and the strongest have the advantage of either the oak or the rush, for they can be strong as the oak when it is necessary, and can give in gracefully when that is necessary. Many great men in history were like this, but many bent and gave in to save themselves, even at the cost of their honour, when it would have been nobler to break altogether, even though that meant losing all their power.

The next questions begin on page 1055.

GOOD KING WENCESLAS WENT FORTH

PAGE AND MONARCH FORTH THEY WENT, FORTH THEY WENT TOGETHER,
THROUGH THE RUDE WIND'S WILD LAMENT, AND THE BITTER WEATHER

From the painting by Sheridan Knowles



THE POETS AND CHILDHOOD

CONTINUED FROM PAGE 827

THE pure love of mother and father for their little ones is seen in the poetry of the different peoples, and in our own happy country the love of little children is stronger than in almost any other land. It is one of the many things that have helped to make our country great and powerful. In China little girls are despised by their parents, and used to be killed because their parents thought they had no use for them. But in China's neighbour, Japan, little children have always been loved as much as in our own land.

As we read the American poets we shall find that few indeed have not written poems for or about the little children. "Suffer the little children to come unto Me," said Jesus, and our poets seem ever to have regarded childhood as something sacred because Jesus first sanctified the love of children.

Big books might be made up of the poems of childhood. In our own Book of Poetry an immense number of pieces are about children. We have seen how such great poets as Longfellow and Tennyson and Browning loved to turn from the graver subjects to write for children. But we have also seen that a vast amount of general poetry written not specially for young people can come into a child's book of poetry. There is a reason for this, and we will see if it can be made clear.

As a great thinker has wisely said, true genius is nothing more than the power to be children again at will. The genius is really a man whose head has grown old, but whose heart, like Peter Pan, has not "grown up." He remains, in advanced years, young in heart. Now, all the beautiful things of this world are seen best and understood best by the simple-hearted. Did not Jesus say that only "the pure in heart" shall see God? Nay, more. He said, "Except ye be converted, and become as little children, ye shall not enter into the kingdom of heaven."

This really means that grown-up people must go back to the simple faith and pure-heartedness of childhood. What a grand thought is here for all young people! The whole glory of the world is with the young, because they have simple hearts. So is it with most of our great poets. Tennyson and Longfellow, being men of genius, had this power to "convert" themselves into little children at will; with all the buffeting of life's daily battle, all the trials of faith which must be met by each one of us, their simplicity of heart remained.

This really explains why so much of our poetry is suitable for boys and girls, and also why so much good poetry has been written by our lesser poets especially for children. This splendid inheritance of the poetry of childhood is something of which all our boys and our girls have good reason to be proud.

Another thing is indicated by what we have just said—that, while a great amount of our poetry has been written for boys and girls, there is no reason why that should be the only class of poetry they should read. Boys and girls may read all that is best in poetry just as well as their mothers and fathers can read it.

GOOD KING WENCESLAS

All over the world where carols are sung in the English tongue this carol of "Good King Wenceslas" is sung at Christmas-time; but the lesson it teaches of a king's humility is appropriate at all times, for people as well as for kings, and we cannot learn this lesson too well.

Good King Wenceslas looked out
On the feast of Stephen,
When the snow lay round about,
Deep and crisp and even.
Brightly shone the moon that night,
Tho' the frost was cruel;
When a poor man came in sight,
Gathering winter fuel.

"Hither, page, and stand by me,
If thou know'st it telling—
Yonder peasant, who is he,
Where, and what, his dwelling?"
"Sire, he lives a good league hence,
Underneath the mountain,
Right against the forest fence
By Saint Agnes fountain."

"Bring me flesh and bring me wine,
Bring me pine-logs hither;
Thou and I will see him dine,
When we bear them thither."
Page and monarch forth they went,
Forth they went together,
Through the rude wind's wild lament,
And the bitter weather.

"Sire, the night is darker now,
And the wind blows stronger;
Fails my heart I know not how—
I can go no longer."
"Mark my footsteps, good my page,
Tread thou in them boldly;
Thou shalt find the winter's rage
Freeze thy blood less coldly."

In his master's steps he trod,
Where the snow lay dinted.
Heat was in the very sod
Which the saint had printed.
Therefore, Christian men, be sure,
Wealth or rank possessing,
Ye who now will bless the poor
Shall yourselves find blessing.

THE GREEDY BOY

In the early years of last century Mrs. Elizabeth Turner wrote "The Daisy," and other books named after flowers, for children. They were quaint little books of prose and verse, and the following lines are taken from one of them.

Sammy Smith would drink and eat
From morning unto night;
He filled his mouth so full of meat,
It was a shameful sight.

Sometimes he gave a book or toy
For apples, cake, or plum;
And grudged if any other boy
Should taste a single crumb.

Indeed, he ate and drank so fast,
And used to stuff and cram,
The name they call'd him by at last
Was often Greedy Sam.

THE YOUNG MOUSE

This has been a children's favourite for eighty years or more. It was written by Jeffreys Taylor, a brother of Jane and Ann Taylor, who wrote so many well-known children's poems, and it ranks high among the verses of its kind.

In a crack near a cupboard, with dainties provided,
A certain young mouse with her mother resided;
So securely they lived on that fortunate spot,
Any mouse in the land might have envied their lot.

But one day this young mouse, who was given to roam,
Having made an excursion some way from her home,
On a sudden return'd, with such joy in her eyes
That her grey sedate parent express'd some surprise.

"O mother!" said she, "the good folks of this house,
I'm convinced, have not any ill-will to a mouse;
And those tales can't be true which you always are telling,
For they've been at the pains to construct us a dwelling.

"The floor is of wood, and the walls are of wires,
Exactly the size that one's comfort requires;
And I'm sure that we should there have nothing to fear,
If ten cats with their kittens at once should appear.

"And then they have made such nice holes in the wall,
One could slip in and out with no trouble at all;
But forcing one through such crannies as these
Always gives one's poor ribs a most terrible squeeze.

"But the best of all is, they've provided us well,
With a large piece of cheese of most exquisite smell;
'Twas so nice, I had put my head in to go through,
When I thought it my duty to come and fetch you."

"Ah, child!" said her mother, "believe, I entreat,
Both the cage and the cheese are a horrible cheat.
Do not think all that trouble they took for our *good;*
They would catch us and *kill* us all there if they could,
As they've caught and killed scores; and I never could learn
That a mouse, who once entered, did ever return!"

Let the young people mind what the old people say,
And when danger is near them keep out of the way.

"I remember, I remember
The house where I was born."

I REMEMBER, I REMEMBER

In this famous poem by Thomas Hood the author seeks to endear to us the pure joys of childhood, the happiest years of all. Memory is the friend of old people, for it enables them to recall the happy days of long ago, days which now exist for all boys and girls. There is a tone of sadness in Hood's poem, as he knew sorrow and much ill-health when he was a man. A happy, healthy childhood is the most lasting of all the joys on earth; something worth remembering.

I REMEMBER, I remember
The house where I was born,
The little window, where the sun
Came peeping in at morn;
He never came a wink too soon,
Nor brought too long a day;
But now I often wish the night
Had borne my breath away!

I remember, I remember
The roses, red and white,
The violets and the lily-cups,
Those flowers made of light!
The lilacs, where the robin built,
And where my brother set
The laburnum on his birthday
The tree is living yet!

I remember, I remember
Where I was used to swing,
And thought the air must rush as fresh
To swallows on the wing.
My spirit flew in feathers then,
That is so heavy now;
And summer pools could hardly cool
The fever on my brow!

I remember, I remember
The fir trees, dark and high;
I used to think their slender tops
Were close against the sky:
It was a childish ignorance,
But now 'tis little joy
To know I'm farther off from Heaven
Than when I was a boy.

THE HOMES OF ENGLAND

Mrs. Hemans was a favourite poetess in the days of our grandfathers. She died in 1835. Though not a great writer, yet she composed many beautiful poems, which will not soon be forgotten, as her words were sweet and her thoughts were full of kindness and love. This delightful poem presents the verdant charm, beauty and variety of the homes of England.

THE stately homes of England!
How beautiful they stand,
Amidst their tall ancestral trees,
O'er all the pleasant land!
The deer across their greensward bound,
Through shade and sunny gleam;
And the swan glides past them with the sound
Of some rejected stream.

The merry homes of England!
Around their hearths by night,
What gladsome looks of household love
Meet in their ruddy light!
There woman's voice flows forth in song,
Or childish tale is told,
Or lips move tunefully along
Some glorious page of old.

The blessed homes of England!
How softly on their bowers
Is laid the holy quietness
That breathes from Sabbath hours!
Solemn, yet sweet, the church-bell's chime
Floats through their woods at morn;
All other sounds, in that still time,
Of breeze and leaf are born.

The cottage homes of England!
By thousands on her plains,
They are smiling o'er the silvery brooks,
And round the hamlet's fanes.
Through glowing orchards forth they peep,
Each from its nook of leaves;
And fearless there the lowly sleep,
As the birds beneath their eaves.

The free, fair homes of England!
Long, long, in hut and hall,
May hearts of native proof be reared
To guard each hallowed wall!
And green for ever be the groves,
And bright the flowery sod,
When first the child's glad spirit loves
Its country and its God!

THE FATHERLAND

While it is right that we should be proud of our native land, it is also right that we should not admire anything which is not noble and true, even if it is found in our native land. The true "Fatherland" means any country, anywhere, that can show deeds of mercy, justice, and brotherly love. That is what James Russell Lowell, our famous American poet, who wrote this poem, wants us to feel. In a word, we have to admire these grand qualities wherever we find them, be it in America or elsewhere.

WHERE is the true man's fatherland?
Is it where he by chance is born?
Doth not the yearning spirit scorn
In such scant borders to be spanned?
Oh yes! his fatherland must be
As the blue heaven, wide and free!

Is it alone where freedom is,
Where God is God and man is man?
Doth he not claim a broader span
For the soul's love of home than this?
Oh yes! his fatherland must be
As the blue heaven, wide and free!

Wnere'er a human heart doth wear
Joy's myrtle-wreath or sorrow's gyves,
Where'er a human spirit strives
After a life more true and fair,
There is the true man's birthplace grand,
His is the world-wide fatherland!

Where'er a single slave doth pine,
Where'er one man may help another—
Thank God for such a birthright, brother—
That spot of earth is thine and mine!
There is the true man's birthplace, grand,
His is a world-wide fatherland!

A WISH

Samuel Rogers, who died in 1855, was a wealthy banker and the friend of many poets and literary men. He wrote a good deal of poetry, but not of a very high order. "A Wish" is a pretty little poem in praise of the simple country life, and it is interesting to know that its author lived in a splendid mansion all his life. How true it is that we most admire those things which we have not got!

MINE be a cot beside a hill;
A beehive's hum shall soothe my ear;
A willowy brook that turns a mill
With many a fall shall linger near.

The swallow, oft, beneath my thatch,
Shall twitter from her clay-built nest;
Oft shall the pilgrim lift the latch,
And share my meal, a welcome guest.

Around my ivied porch shall spring,
Each fragrant flower that drinks the dew;
And Lucy, at her wheel, shall sing
In russet gown and apron blue.

The village church among the trees,
Where first our marriage vows were given,
With merry peals shall swell the breeze
And point with taper spire to heaven.

THE SHIP OF STATE

The Constitution and Laws of the land are here personified and addressed as the "Ship of State," by the widely loved household poet, Henry Wadsworth Longfellow.

SAIL on, sail on, O Ship of State!
Sail on, O Union, strong and great!
Humanity, with all its fears,
With all the hope of future years,
Is hanging breathless on thy fate!
We know what Master laid thy keel,
What Workmen wrought thy ribs of steel,
Who made each mast, and sail, and rope;
What anvils rang, what hammers beat,
In what a forge and what a heat
Were shaped the anchors of thy hope!
Fear not each sudden sound and shock—
'Tis of the wave, and not the rock;
'Tis but the flapping of the sail,
And not a rent made by the gale!
In spite of rock, and tempest roar,
In spite of false lights on the shore,
Sail on, nor fear to breast the sea!
Our hearts, our hopes, are all with thee.
Our hearts, our hopes, our prayers, our tears,
Our faith, triumphant o'er our fears,
Are all with thee, are all with thee!

THE MOUNTAIN AND THE SQUIRREL

Emerson was a famous American writer and thinker. He was seldom humorous in his poems, but this is one of the exceptions. Though the verse is humorous, its lesson is quite serious, for it reminds us that we have each our particular work to do and our special abilities for doing it. The all-wise Creator has not made us all alike, and we must do our best with the gifts He has given us.

THE mountain and the squirrel
Had a quarrel,
And the former called the latter "Little prig;"
Bun replied,
"You are doubtless very big;
But all sorts of things and weather
Must be taken in together
To make up a year,
And a sphere.
And I think it no disgrace
To occupy my place.
If I'm not so large as you,
You are not so small as I,
And not half so spry;
I'll not deny you make
A very pretty squirrel track.
Talents differ; all is well and wisely put;
If I cannot carry forests on my back.
Neither can you crack a nut."

LITTLE VERSES FOR VERY LITTLE PEOPLE

THERE WAS AN OLD WOMAN WHO LIVED IN A SHOE
BEWARE OF THE DOG
TRADESMEN'S ENTRANCE
SHE HAD SO MANY CHILDREN SHE DIDN'T KNOW WHAT TO DO;
SHE GAVE THEM SOME BROTH WITHOUT ANY BREAD,
SHE WHIPPED THEM ALL SOUNDLY, AND SENT THEM TO BED . . .

There was an old woman, as I've heard tell,
She went to the market, her eggs to sell;
She went to the market all on a market day,
And she fell asleep on the king's highway.

There came by a pedlar, whose name was Stout,
He cut her petticoats all round about:
He cut her petticoats up to the knees,
Which made the old woman to shiver and freeze.

When the little woman first did wake,
She began to shiver and she began to shake,
She began to wonder and she began to cry:
"Oh, deary, deary me, this is none of I!

"But if it be I, as I do hope it be,
I've a little dog at home and he'll know me;
If it be I, he'll wag his little tail,
And if it be not I, he'll loudly bark and wail."

Home went the little woman all in the dark,
Up got the little dog, and he began to bark;
He began to bark, so she began to cry:
"Oh, deary, deary me, this is none of I!"

LITTLE VERSES FOR VERY LITTLE PEOPLE

LITTLE Boy Blue, come blow up your horn,
The sheep's in the meadow, the cow's in the corn;
But where is the boy that looks after the sheep?
He's under a haycock, fast asleep.
Will you awake him? No, not I;
For if I do he'll be sure to cry.

IN April,
Come he will;
In May,
He sings all day;
In June,
He changes his tune;
In July,
He makes ready to fly;
In August,
Go he must.

MULTIPLICATION is vexation,
Division is as bad;
The Rule of Three perplexes me,
And Practice drives me mad.

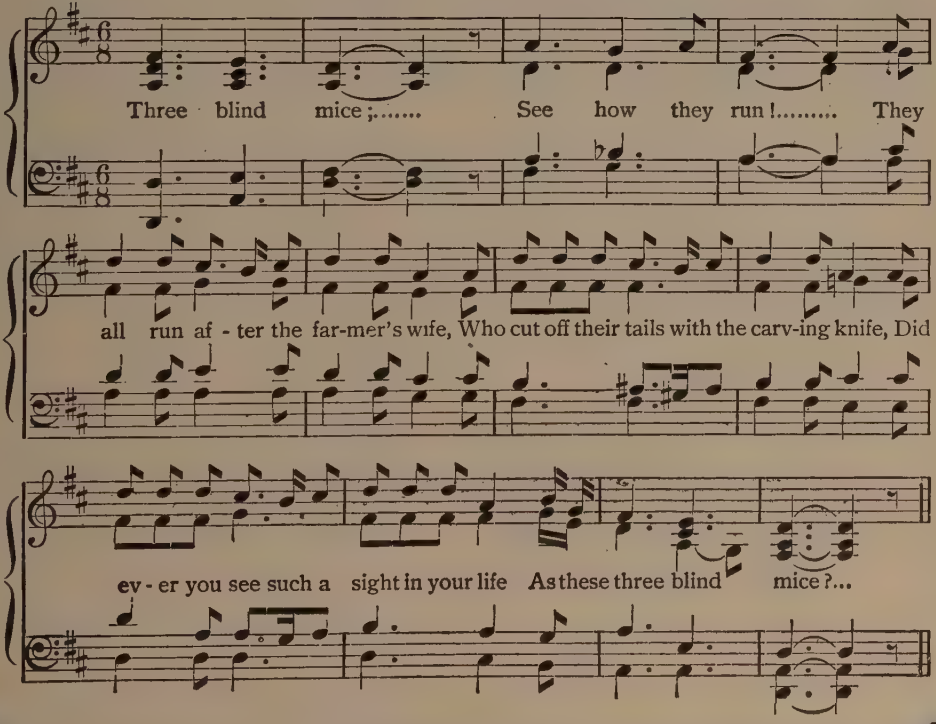
POLLY, put the kettle on,
Polly, put the kettle on,
Polly, put the kettle on,
And let's drink tea.

Sukey, take it off again,
Sukey, take it off again,
Sukey, take it off again,
They're all gone away

HE that would thrive
Must rise at five;
He that hath thriven
May lie till seven;
And he that by the plough would thrive,
Himself must either hold or drive.

THE cock's on the housetop, blowing his horn;
The bull's in the barn, a-threshing of corn;
The maids in the meadows are making of hay;
The ducks in the rivers are swimming away.

THREE BLIND MICE


Three blind mice;..... See how they run!..... They
all run af - ter the far-mer's wife, Who cut off their tails with the carv-ing knife, Did
ev - er you see such a sight in your life As these three blind mice?...

PUZZLE PICTURES FROM ENGLISH HISTORY

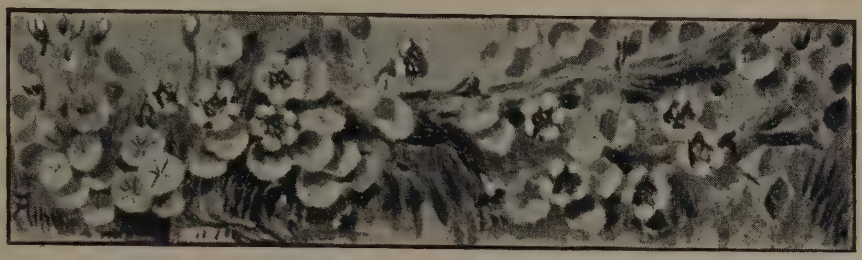
The death of Harold. Find William the Conqueror

Edward the First with his troops. Find Robert Bruce.

A charge at the battle of Blenheim. Find a number of generals.

Charles the First. Find Oliver Cromwell.

The Duke of Wellington on his horse. Find Napoleon.



A LITTLE GARDEN MONTH BY MONTH

WHAT TO DO IN THE MIDDLE OF JUNE

CONTINUED FROM PAGE 836

JUST as it is necessary to stake and tie plants as soon as they need it, so it is necessary to "stick" our sweet peas.

The pea-sticks must be sufficiently high, and they must be placed firmly in the ground. It may be necessary to put a few small branches among the plants to help them during their early stages, if the sticks are rather bare at the base. Where proper pea-sticks are not available, ordinary stakes must be used, with string wound from one to another, upon which the peas can grow. Not only must we provide support for the sweet peas, but all other climbing plants must have something upon which to grow. Nasturtiums are very pretty trained over an old tree-stump, as our picture shows, but it must be in a sunny position.

If the edging of the little garden plot be of live box, this may be neatly trimmed, so that everything shall be tidy and trim for the summer; empty pots should be cleared away directly they are done with, and weeds should be removed as soon as they appear.

It may be that we have among our spring flowering plants some beautiful double or large single violets. Now, it happens that, if we want them to produce as many flowers as possible, we must not forget our violet plants during any part of the summer. Frequently, in dry weather, they will need watering, and we shall see from the old plants long shoots, or *runners*, appearing from time to time. A great deal of the strength of the plant goes to the runners if these are allowed to remain, so that directly they are noticed they should be removed, and a look-out will have to be kept all through the summer and autumn.

But supposing we find that these runners have so far developed that they have almost the appearance of little plants? It is just possible they may even have struck root. These may be removed, and planted, and, whether they have roots or not, fine young plants will soon be formed. Some keen young gardeners will wonder if it is possible to have flowers in late autumn and winter. This is quite possible, and it is this that makes violets so prized and useful. If we take care of our violet plants now, and if there happens to be a garden frame we can use, we may plant them in this frame in the early autumn, and we shall be able to pick a fine bunch of flowers before winter.

Where we have a rose-tree or two, a sharp look-out must be kept for green fly: these little pale green insects infest the leaves and growing flower-buds. Many washes are recommended to destroy them, but there are few ways of getting rid of them better than clearing the leaves with the fingers, where it means only one or two bushes to deal with. Roses are thirsty, greedy things, and if a little liquid stable manure be mixed with the water that is given them, the roses will be finer and more numerous.

Where a very fine blossom is wanted, say, for instance, to exhibit at a show, only one flower-bud is allowed on the branch, and all the others are pinched off while still quite small. This is called *disbudding*.

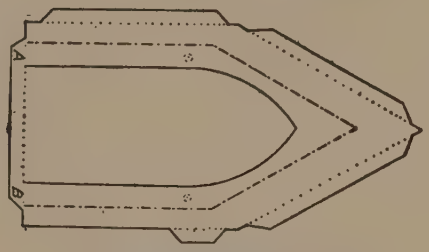
It is sometimes a matter of great difficulty to water rose-trees, or indeed any plant growing on a bank, and as some of our garden plots will be so situated, it will be helpful to tell how to overcome the difficulty. We may take a rose-tree as an example. We water, but the moisture runs along the surface and very little sinks into the ground where we desire to have it. Beside the stem of the rose-tree, and on the top side of it, we may dig a hole just large enough to sink a small flower-pot to the rim. Into this the water can be poured, and it can be filled up again and again, and a great deal more water will reach the roots by this simple device than otherwise would be possible.

If hard tap-water has to be used for watering any of our plants, it is a good plan to draw it off in the morning, and expose it to the sun and air all day, as this helps to soften it and makes it of a more equal temperature with the atmosphere.

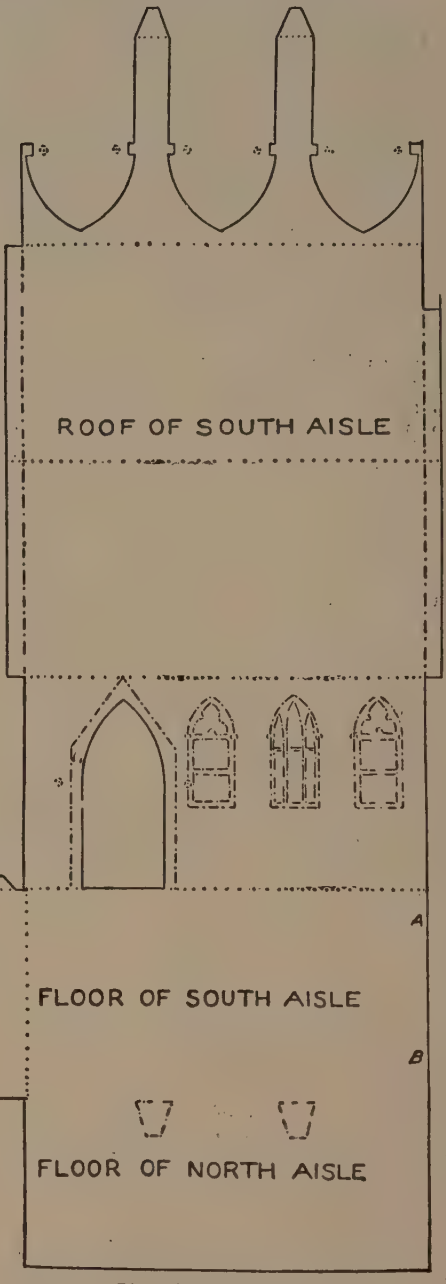
The ferns that we repotted in April must now be very carefully watered.

PLANS FOR A CHURCH IN MODELTOWN

1. Design of the church from the back



2. Plan of end of south aisle : half-scale
Use scale-rule B



3. Plan of south aisle : half-scale
Use scale-rule B

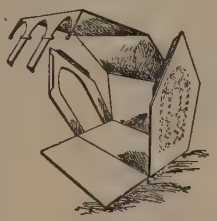
4. Church, showing side and front

THE BUILDING OF MODELTOWN CHURCH

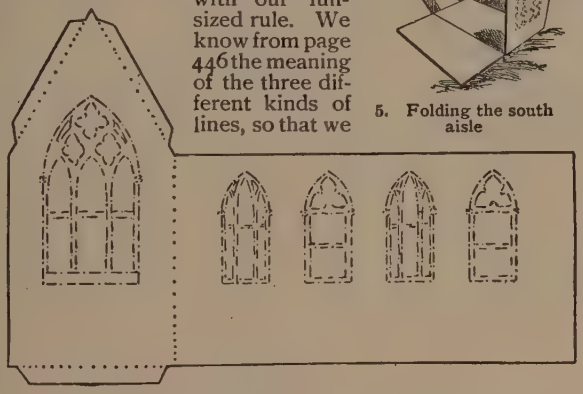
As soon as a few houses have increased in number, and grown into a village, a church is erected. Every village has its church, and we must therefore add a church to Modeltown. But, because Modeltown is going to be more important than a small village, we must give it a handsome church. Up to now the people in Modeltown have used the school as a church; and a school-church is better than no church at all. But the time always comes when people want a real church, and this we shall now give our villagers or townspeople.

In pictures 1 and 4 we see what our church will be like. Picture 4 shows the church as seen from the front. This picture does not show the top of the tower with the weather-vane, but picture 1, which is a view of the church from the back, gives the tower complete.

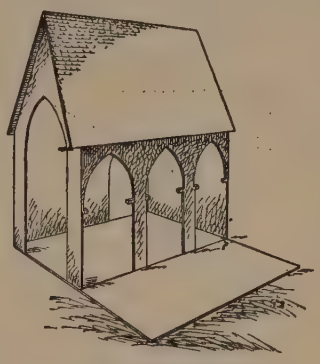
First we draw on our card and cut out the plans in pictures 2 and 3, which make the south aisle. The pictures are half-scale, so that we take the sizes with scale-rule B, and make the lines upon our card with our full-sized rule. We know from page 446 the meaning of the three different kinds of lines, so that we do not need to go over all that again. Before folding up the cards which we have cut out, we glue the smaller portion of the south aisle, of which picture 2 is the plan, into its place on the floor of the aisle. The place marked A and B on picture 2 is glued to the place marked A and B on picture 3, and thereafter we treat the two pieces joined up as if they were one piece. Picture 5 shows the two pieces joined into one, and being folded up. Picture 7 shows them glued together and standing upright. It will be noticed that the feet of the two pillars, when bent over, rest upon the places maked on the plan in picture 3. These pillars must be glued down exactly into place, or the aisle will not be straight. The tops of the two end walls must be glued under the roof up to the chain line in picture 3, and this also must be neatly done if the church is to be neat and regular.



5. Folding the south aisle



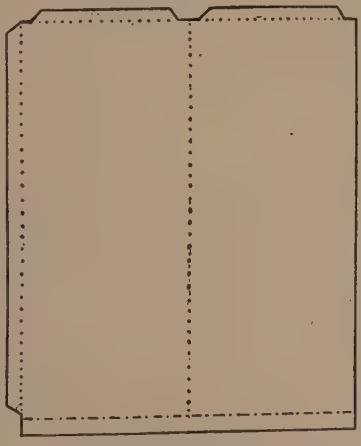
6. North aisle: half-scale. Use scale-rule B



7. South aisle completed

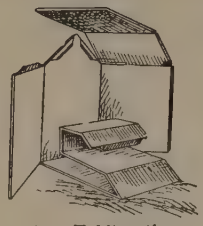
Now we come to the north aisle, the floor of which is already made as part of the south aisle. Picture 6 is the plan of the side wall and end of the north aisle, and is half-scale, so that when drawing it on the card we take the measurements with scale-rule B, making our drawing with the full-sized rule. Then we make the north aisle roof, the plan of which is given in picture 8. This also is half-scale, so again we use rule B in taking the measurements. Having made the roof, we glue it into position on top of the walls as seen in picture 9, after which we glue both to the south aisle and to the floor of the north aisle, which we made along with the south aisle. Having done this, we have completed the main body of the church, but have yet to make the chancel and tower.

The plan of the chancel is shown half-scale in picture 15, and we proceed to draw this on card, still using scale-rule B, and cut it out. Some of the dotted lines have small circles at each end. The card must be cut half through at these lines, not on the side of the card on which the drawing is made, but on the other side of the card. Part of this piece is the altar, and it requires careful bending up to be done neatly. Picture 10 indicates how it appears when being folded into the correct position, and picture 11 shows the altar and the raised floor of the chancel. Where the altar touches the end wall of the chancel, it must be glued in such a

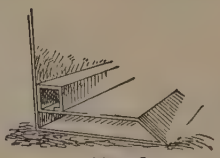


8. Plan of roof of north aisle: half-scale Use scale-rule B

9. North aisle, with roof

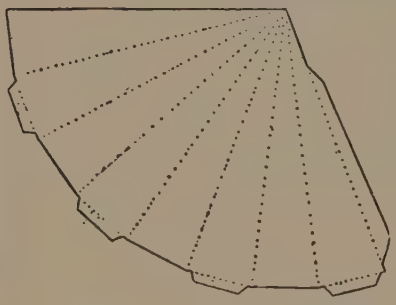


10. Folding the chancel



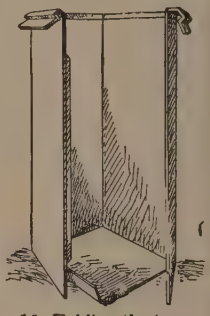
11. Altar floor

12. Chancel complete

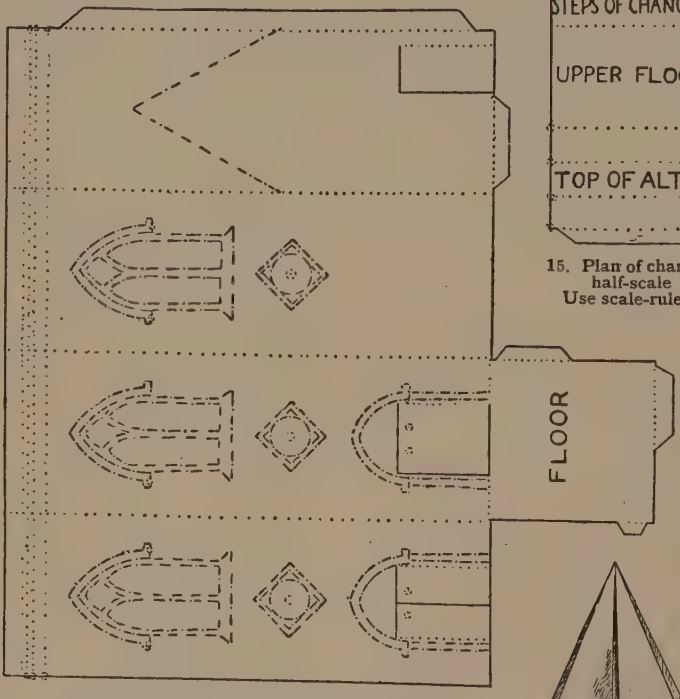


14. Plan of steeple half-scale Use scale-rule B

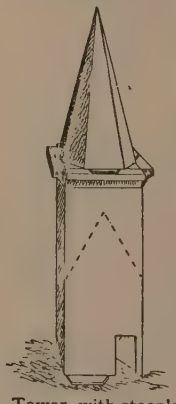
13. Cope of tower



16. Folding the tower

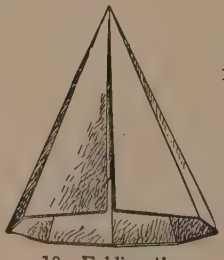


15. Plan of chancel half-scale Use scale-rule B



19. Tower, with steeple

17. Plan of tower: half-scale. Use scale-rule B



18. Folding the steeple

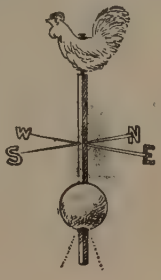
20. Plan of corners of steeple

position that the raised floor will be quite level. After gluing together, the chancel from the inside will appear as seen in picture 12.

We now come to wnat is perhaps the most difficult piece of all — namely, the church tower. Its plan is given in picture 17, and is half-scale, so that we make it accordingly, taking our measurements from the picture with rule B, and making the lines upon the card with our full-sized rule. The tower is folded up as shown in picture 16. Care must be taken with the cope or moulding at the top ; and picture 13 is intended to show us how this should be bent over so as to make the top look heavy and solid. The steeple is of rather irregular

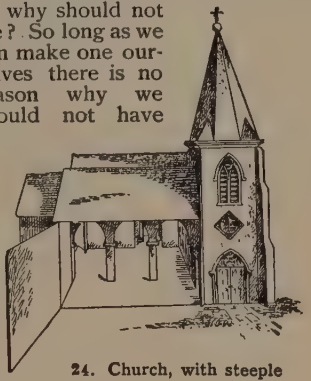
21 22
Buttresses: half-scale. Use scale-rule B

form. The plan of it in picture 14 is half-scale—that is to say, we use scale-rule B in taking the sizes from the plan. Having cut out the steeple, we fold it up into a pointed shape as shown in picture 18, and glue the edges together by means of the projecting slip. The steeple is now glued to the top of the tower, and will have the appearance of picture 19. It must be put on quite straight or the result will be very bad. The tower and steeple are not yet complete : we have to make four corner-pieces for the base of the steeple just above the tower. The plan of the corner-pieces is given full size in picture 20. We must make four of these, and glue them into place as indicated in picture 24. The tower can be strengthened and its appearance made better by adding some buttresses to it. There are four buttresses for the two corners at the front of the tower, two as the plan given in picture 21, and two as the plan given in picture 22. The plans are half-scale, so that we use scale-rule B for the measurements. Having drawn and cut out two of each, we glue them to the front corners of the church tower, one of 21 and one of 22 to each corner, as shown in pictures 1, 4, and 24. The folded slips at the sides of the buttresses are glued to the sides of the tower. Then we make another buttress as plan 21, and another as plan 22, which we fix to the corners of the tower next the aisles, in the same way as we have fixed the buttresses to the front corners.



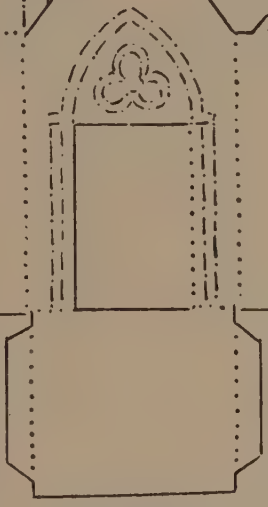
23. Vane

A good many churches have vanes, or weathercocks, so why should not we? So long as we can make one ourselves there is no reason why we should not have one. We get a large wooden match, and put it through a fairly large bead—say, a bead from a necklace. Then we open the top of the steeple a little at the extreme point, and, having put some hot glue on the match below the bead, we push the match into the steeple until the bead is right on the top of the point of the steeple. Now we take two small, thin pins and push them half-way through the match, as seen in picture 23. The four letters, N., E., S., and W.—standing for North, East, South, and West—can be cut from any newspaper, but it will be better to cut them from a magazine or other book with thicker paper than a newspaper. A touch of glue or a little sealing-wax will enable us to attach the letters to the four ends of the two pins. We have only the cock to add to the top to complete the weathercock. We can make a



24. Church, with steeple

26. South aisle porch folded up



25. Plan of the porch actual size

small drawing of a cock on thin card or thick paper and pass a pin through it vertically. This we push into the stem of the match, and then the weathercock, as in picture 23, is finished. The tower with steeple and buttresses is also finished, and requires to be attached to the front of the church in the usual way. It is glued to the end of the north aisle that was left open, and its position is shown in picture 24.

Only one thing remains to be made—a porch for the side door of the south aisle. The plan for this is shown full size in picture 25, and in drawing it we therefore use the full-sized rule only. As it is being folded up it will appear as seen in picture 26, and picture 4 shows the position upon the aisle. That completes the structural part of the church,

Photograph of Modeltown Church as finished

which can be finished as we have finished many of the other buildings. We will make lines round all the windows to make them prominent, and the parts that represent glass we will colour the usual blue. The doors will look well if we paint them dark red, and we can do this with red paint, or, if more convenient, with red ink, darkened with a few drops of black ink. We can make the roof a slate colour, as it would probably be covered with slates in a real church. A church made according to these instructions has been photographed, and is shown on this page. If we have followed the instructions carefully, the church that we have made will look like it.

MUSTARD AND CRESS GROWN ANYWHERE AT ANY TIME

Most people like mustard and cress, and it is at all times a very useful salad. A very interesting way of growing these little plants at any time of the year may be followed quite easily if the directions given are carefully observed.

All that we shall need for the purpose are a couple of wooden sweet-boxes, two pieces of clean flannel or blanket, measuring a little more than the boxes do, and, of course, a packet each of mustard and cress seed. The first thing to do will be to take away the lids of the boxes, and then, without damaging the sides, knock out the bottoms as well. Now we take the pieces of flannel and tie a bit over each frame.

Each of these must be stretched over the place where the bottom of the box was, and held down to the sides by tying a length of string all round. Thus we shall have something which will be like a square tambourine, only instead of parchment or paper there will be flannel. One of these boxes is for the mustard, the other for the cress.

As mustard seed grows much more quickly than cress, it should not be sown till later. We take the box which we are going to use for the cress and thoroughly wet the flannel. Now we get our packet of cress seed and open it, and sprinkle the seed fairly thickly over the flannel.

It will be found that the seeds will stick well to the damp flannel and will not roll about. If we want the seed to grow very quickly, we shall put the box, when the seed has been sown, into a warm, dark cupboard. Twice a day the seeds should be looked at, and if it seems that they are at all dry they must be well sprinkled with water. At the end of three days the seeds should have started into growth, and we shall be able to see the little shoots and roots breaking through the cases.

It is now time to sow the mustard seed, and this must be accomplished in just the same way as was adopted in the case of the cress. As soon as the seed has been sprinkled over the flannel, we remove the box in which it has been sown to a dark place, such as a cellar or any cupboard that may be available, where the seed will germinate, just as the cress did.

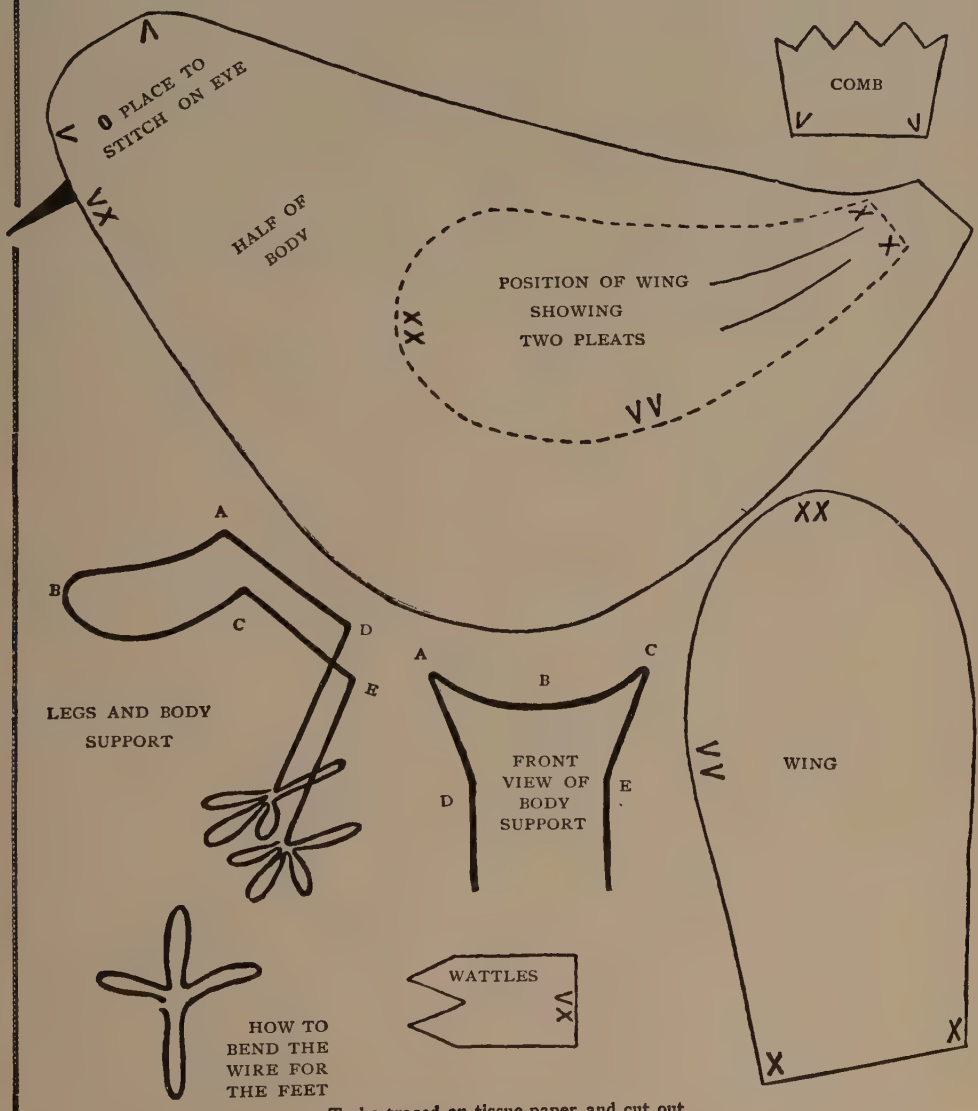
It will now be necessary to remove the box with the cress into the light; if it is summer we may place it in a sheltered place out of doors, but in winter the situation chosen should be in front of a window in a warm room. After another three days we may bring the mustard out into the light, and the two boxes can be placed side by side.

All this time it is most important that the seedlings should on no account be allowed to want for water. During the winter it will be found that, if the water is given just lukewarm, the plants will grow much more rapidly. When the seedlings are about two inches in height, it will be time to gather our crop of salad. With a good large pair of scissors the stalks may be cut close to the flannel, and they will be found to be very tender, as, indeed, will be the leaves of the little plants. Moreover, as there was no mould to make them dirty, a little washing will soon make them quite ready for use.

THE BARN-DOOR COCK FOR OUR TOY ZOO

OUR barn-door cock is made of plush of any suitable colour. A scrap of red flannel, or, better still, cloth, will be wanted for comb and wattles, and a piece of dark green silk or satin—"shot" silk, if you can get it—for his tail.

His body, having no under part, is very simple to make. Leave the tail end open for the insertion of the tail, as well as a little hole where we shall want to stick the beak in. The comb should be fixed in position at the outset, and sewn in with the seam on the top of the bird's head. The wings are turned in at the edges and hemmed on to the body after it is stuffed, in the position shown, with two pleats as marked in the pattern. For the tail, cut a piece of silk four inches long and three inches wide; slit this for two inches of its width into quarter-inch strips, each of which may be slightly ravelled out into a fringe at the tip and the edges. These are the tail feathers. Bind the part that is not slit round a piece of doubled wire about two inches long; curve the wire, and lightly tack some of the ravelled strips on to it so as quite to hide it. You have then a plume. The



To be traced on tissue-paper and cut out

PATTERNS FOR THE COCK FOR OUR TOY ZOO

stem of the plume must be bent back till the whole wire is something like a figure 2. Then insert the straight part into the bird's body, and firmly sew it into position.

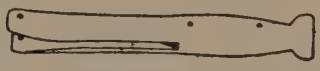
The legs, feet, and support of the body are *all in one*. It takes about sixteen inches of wire, bent as shown in the pattern. The thigh part must on each leg be covered with a piece of plush, shaped as shown here, and leaving about an inch of length to spare at the wide end. A little wadding must be folded in with this covering when it is sewn on to the leg. When the legs are finished, make them stand on the table, and taking your bird's body, which should also be quite finished, rest it on the frame, A B, in the pattern, to find out just where it must be poised to perfectly balance, otherwise your cock will never stand alone.

The cock for our toy Zoo

When you have found out the right position, be careful to fix it, by sewing A, B, and C to the bird's breast. Then the spare inch of plush at the tops of the legs must be turned in at the edge and hemmed on to the breast so as to hide the wire support entirely. The eye is a bright jet bead; the beak, a pointed and blackened splinter of wood. The red wattles sewn on just under it only remain to be added, and your cock-a-doodle is complete.

THE FIGHTING CLOTHES-PEGS

Few toys afford more genuine amusement than this one, and few can be so easily and cheaply made. The material consists only of two round clothes-pegs, such as can be bought at any grocer's or hardware store, a few pieces of thin wire, which can be purchased at any plumber's or tin-shop, a pin, and a piece of strong black thread.

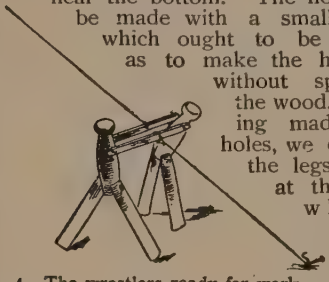


1. Clothes-peg, with holes

2. Body of peg

3. Slip for arm

We first take two clothes-pegs and pierce them with holes at the places marked in picture 1. That will give us in each peg four holes in all—one about three-quarters of an inch from the top, one through the middle of the peg just above the legs, and one through each leg near the bottom. The holes should be made with a small bradawl, which ought to be sharp so as to make the holes clean without splitting the wood. Having made the holes, we cut off the legs right at the top where they are joined to the body of the peg, leaving the top of the peg as seen in picture 2.



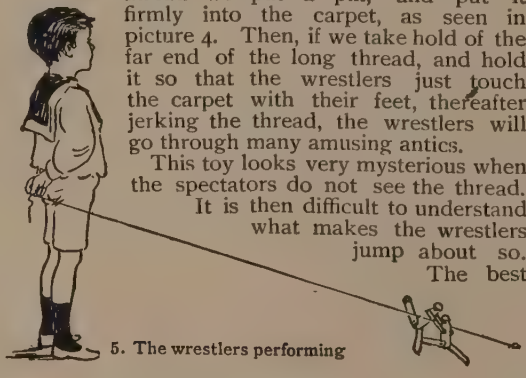
4. The wrestlers ready for work

Now we take two thin slips of wood about three inches long, and make three holes in each—one in the centre and one near each end, as seen in picture 3. We take the pieces of thin wire and join the slips of wood we have just made to the body of the pegs, one slip of wood to each side, as seen in picture 4. These slips do duty for arms, as can easily be seen from the picture. We bend over the wire at each end into the form of a loop, so that the arms will not slip off, but we must give room on the wire so that the arms can work round very easily indeed. Then the wire outside the loops can be cut off if it is too long.

Now the legs must be attached, wires being put right through the lower hole in the body, and the legs put on the wire by the holes which we have made. These also must work very easily, and the wire should be bent into loops at the ends and cut off just as when the arms were put on. We now take a strong piece of black thread nine or ten inches long, and tie one end of it through the hole in the middle of one of the arms, making a loop at the free end of the thread. A long piece of black thread, say, two or three yards long, should be tied to the other arm, using the hole in the middle of the arm. Our wrestlers are now ready.

Through the loop at the end of the shorter thread we put a pin, and put it firmly into the carpet, as seen in picture 4. Then, if we take hold of the far end of the long thread, and hold it so that the wrestlers just touch the carpet with their feet, thereafter jerking the thread, the wrestlers will go through many amusing antics.

This toy looks very mysterious when the spectators do not see the thread. It is then difficult to understand what makes the wrestlers jump about so. The best way to conceal the thread is to work the toy on the carpet when it is a little dark, and when the fire is the only light in the room. Then, if the performer has a long thread, which he holds behind his back, as in picture 5, the mystery will be complete.

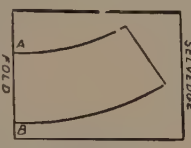


5. The wrestlers performing

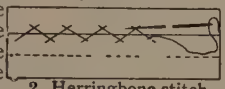
WHAT TO DO WITH A GIRL'S WORK-BASKET

5. The Little Petticoats

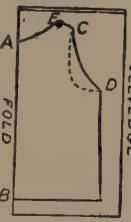
THE next little garment to be made is the flannel petticoat. The pattern of this is very easy, as we can see from pictures on this page. Picture 1 shows half the pattern. Cut this out in tissue-paper, and lay it on a piece of soft, fine flannel which has been folded in half, taking care that A B lies against the fold. Cut all round, *except between A and B.* To make the back seam, join the two edges as for running and felling, but instead of felling the edges, turn them over, and fasten them by herringboning them "*raw-edged.*" The stitch is shown in picture 2. Leave a placket-hole at the top and make the edges neat by two tiny hems, herringboned, like the seam, to keep them flat. When you have gathered the material, regulate the gathers, so that the front of the petticoat is nearly flat, and all the fulness is at the back. These gathers do not need to be put into a band, as we shall see presently.



1. Pattern of flannel petticoat


2. Herringbone stitch

The next thing to do is to make the little bodice which has to be joined on to the petticoat. Look at picture 3, and you will see half of the very simple outline of the pattern needed to make this bodice. It is in one piece, and needs no seam except the tiny ones on the shoulders—that is, between E and C.

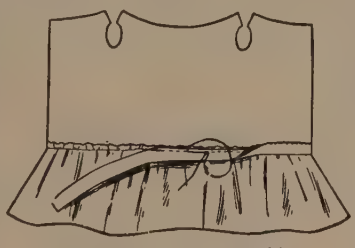


3. Pattern of bodice

After you have drawn the design the right size to fit your doll, fold the piece of flannel in half and put the edge of the pattern marked A B on the fold of the flannel. Then pin it, and cut along the lines of the pattern, except between A and B, leaving enough for the turnings.

The dotted line in picture 3 is to show where to slope out the material for the front of the armhole. If you have forgotten why this should be done, turn to page 577, where we did the same thing.

After the seams on the shoulders have been done, either with a French seam or running and felling, the little bodice must be finished off at the top with buttonhole stitch to match the bottom of the petticoat. Buttonhole stitch, you will remember, we learned on page 577. To make the material strong at the back to hold the buttons and buttonholes, which have to be sewn next, a little hem, herringboned, should be made on each side. If we have cut our pattern correctly, we shall find that we have quite enough material for this without adding on any more. When the bodice is finished, the lower part of it is run on to the gathered skirt, which we said did not need to be put into a band. Now we can understand why this was not necessary


4. Fastening bodice to skirt

Join the bodice to skirt, then, by running stitches, as the little picture (4) shows. But it would be very untidy on the wrong side if we left the raw edges like this, would it not? So, to make it quite neat and dainty, a strip of nainsook is run along the gathers, and then turned over and neatly hemmed down just above. But the stitches must be very tiny ones, because, of course, they will show on the right side.

Trim the raw edge of the skirt part with buttonhole stitches, put on another button and buttonhole to fasten the waist-band, and your little flannel petticoat is finished, and will look like picture 5.

5. The Flannel petticoat

6. The white petticoat

If you like to trim the bottom of the petticoat with a row of feather-stitching, about half an inch from the bottom, it will look all the more dainty.

The white petticoat, which goes over the flannel one, is cut and made in very much the same way. The only difference lies in cutting out the skirt part and the trimming. The bottom should have two little tucks and a narrow hem, edged with tiny Valenciennes lace. These tucks and the hem will take up about 1½ inches of material, so when we cut out the skirt part of the white petticoat it must be longer than the flannel one. It is so simple to cut out that no pattern is needed. It is simply a *straight* piece of stuff cut about 1½ inches longer than the pattern of the flannel.

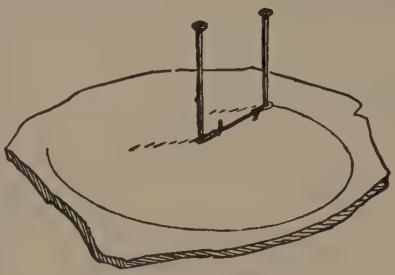
But the important thing to remember is to cut it "on the straight," not "on the cross"—that is, like the flannel one is cut. Material cut on the cross pulls very easily, and is difficult to tuck. Material that is cut on the straight—that is, in a straight line with the selvedge—is firmer and keeps its shape much better. The reason why we cut a flannel petticoat on the cross is, because it sets better and is less clumsy round the hips, for flannel is a clumsy material. The seams of the little white petticoat, which is much thinner than the flannel, should be run and felled, not herringboned.

When the material is cut out for bodice and skirt part, and put together, make the hem and the two little tucks at the bottom, and trim the edge with lace, just like the picture (6) shows, and the little garment is finished. Our doll is nearly dressed now, for next time we shall make the doll's frock.

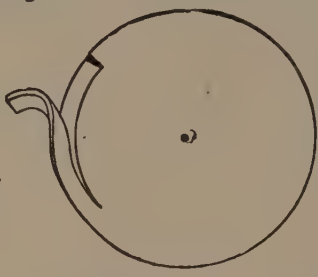
HOW TO MAKE A LEATHER SUCKER

MUCH amusement may be got out of a sucker. It is the simplest toy made, and also the least expensive, because if we have an old boot and a piece of stout string we have all the material necessary for making it. All we need then is a good sharp knife to cut the leather. The leather we require must be not less than three inches across each way it may be fairly stout leather, but not too thick, and the first thing we do is to soak it well in water to make it soft. We may throw it into water and let it lie there all night or longer. When it has been made nice and pliable, make a hole in the middle of it. We can use a thin round wire nail to make the hole, driving it through the leather with a hammer.

1. Loop of string



2. Cutting the circle of leather



3. Trimming the edge of the sucker

The next thing is to make the leather round. We can mark the circle by using compasses, with the hole that we have already made as the centre; but there is a simple way of marking the circle without using compasses. We take a short piece of string and make a loop at each end, like picture 1, so that the two loops are from 1½ to 2 inches apart. Then we put a nail through one loop and the hole that we have already made, and put another nail through the other loop, pressing its point upon the leather. Keeping the string to its full extent, we now move the second nail right round in a circle, pressing all the time, and it will make a circular line as shown in picture 2. By cutting the leather at this line we make a disc, which is the sucker. We can improve it a little by trimming the edge on one side all round in the manner illustrated in picture 3. A good stout string, say, about three feet long, can now be put through the hole, and a knot made on its lower end to prevent it from slipping out again.

4. Using the sucker

The sucker is now ready for use. Soak it in water well, then place it on a large smooth stone and press it down with the foot. The stone can now be lifted by pulling the string, the power of the sucker being great enough to resist the weight of the stone.

Why does the sucker act in the way that it does? Its behaviour is explained by what we know of the weight, or pressure, of the atmosphere. The force with which we pull the string tries to draw the leather away from the stone, but instead of doing so it creates what we call a vacuum, or a space without air, under the leather, and the pressure of the outside air on the stone makes the stone stick to the leather.

THE BOY CONJURER'S JOKE WITH HIS AUDIENCE

AT the end of a series of tricks it is often a source of great amusement to entertain the audience with what schoolboys call a "sell"—a practical joke in the disguise of a conjuring trick. The only apparatus needful is the pencil, and this you can manufacture for yourself. You have merely to change an ordinary pencil in such a way as to make it look like an extraordinary one. For instance, you may paint it in three colours—red, blue, and yellow, successive rings of each colour; or, for lack of paint, coloured paper may be used—anything, in fact, to give it an out-of-the-way appearance.

Having performed a few genuine tricks, you produce the pencil and a blank sheet of paper, inviting the company to examine them. "Now, ladies and gentlemen," you remark, "you notice, no doubt, that this is a rather peculiar-looking pencil. But its appearance is the least of its peculiarities. In point of fact, it is an electric pencil. At present, you see, it writes plain black like any other pencil." Here you make a few marks with it and proceed: "But if I electrify it a little, it will write red, blue, or yellow—in fact, any colour, just as I please. What colour will you have? Choose for yourselves." "Red," we will suppose, is the reply. You gravely breathe upon the pencil, rub it upon your coat-sleeve, and proceed to write the word "Red" in bold letters. "There it is, you see—red. If you had asked for blue or yellow, it would have been just the same." Which nobody can deny.

The success of the trick rests on the fact that the audience have been prepared, by seeing sundry surprising things, to expect something equally surprising. If the trick were offered offhand, without such preparation, some of the audience would probably see through the joke; but if it is led up to in a proper manner, they will hardly ever do so.

Continued on page 1071

WHAT THIS STORY TELLS US

WE know that the whole earth is made of the same kind of stuff, and in these pages we begin a brief study of this stuff, which we call matter. The Greeks, who were at the time of their power the cleverest people who had ever lived, believed that the earth was made of four things—the ground, air, fire, water. These things the Greeks called elements, meaning that the things could not be changed or split up into anything else, but that they were the very foundations of the world. We know now that they were wrong, and that these things are not elements at all, but only mixtures of elements. We now come to read of the real elements, and we begin with the elements that make up the air.

AIR, FIRE, AND WATER

CONTINUED FROM 839

THE Greeks, when they spoke of the earth, probably meant all solid matter. Of course, they knew as well as we do that this solid matter composing the earth under our feet shows itself in many forms, such as gold and silver and iron and sand. But still, all these have a certain resemblance ; they all look much more like each other than like such a very different thing as air; and so they were all grouped together under the one heading of " earth."

Of course, there are living creatures on the earth, such, for instance, as trees, and trees make the stuff called wood, which is different in many ways from the earth we pick up in the garden. But the Greeks recognised, quite rightly, that all living things are made out of the substance of the earth ; that the earth is their *mother*, as they said. And so they still continued to include all solid things, not excepting the bodies of living creatures, as made of the one element *earth*. We now know, however, that the solid ground under our feet, and the living creatures which grow from it, are made up of many different elements, which no power, no kind of treatment, however long continued, will change into each other or will split up into different things, and we know that these are the real elements.

Now let us consider the next thing that the Greeks called an element—the air. We have already learnt that it is real matter, though we cannot see it; but is it really an element, as the Greeks thought —that is to say, is it made of only one thing, which is one and the same everywhere, and which, whatever is done to it, cannot be changed into anything else or split up into simpler things ?

We can answer this question quite positively, for there is scarcely anything that chemists have more carefully studied than the air. *It is not an element, but a simple mixture of a number of elements* which can be sorted out of it, just as you might mix gold and silver by melting them together, and then might separate them from each other afterwards. The air is a mixture of different elements in the gaseous state. Now, I want you particularly to notice the word *mixture*, because it has an exact meaning, and because, when we come to say what we must say about water, we shall find that though water is also not an element, and though it contains two elements, yet *it is not a mixture* of those two elements, but is something else.

The case of water, and thousands of other things, is rather more difficult, and that is why I have purposely taken the air first, because scarcely anything could be more simple than air. The most simple kind of stuff, of course, is one that is simply made of one element, such as gold, or silver, or iron. Nothing could be more straightforward than that. But, after all, the case of the air is not much more difficult, for anyone who has ever added milk to tea, or seen a plum-pudding, knows what a mixture is.

If you take some powdered sugar and a little ground rice, and mix them together, there you have a simple mixture. Now, there is a particular fact about this mixture which must never be forgotten, and I specially do not want you to be careless and to think that you need not attend, because, when we come to the case of water, we shall see the reason why I am going into this question of mixtures now.

WHAT HAPPENS WHEN TWO THINGS MAKE ANOTHER QUITE DIFFERENT

The point about the mixture of sugar and ground rice is this: that, however perfectly they are mixed, the sugar remains sugar and the rice remains rice. *They are mixed, but they are not changed.* After all, it is no more than if you had one grain of rice and one grain of sugar, and put them side by side. The grain of rice is still a grain of rice, and the grain of sugar is still a grain of sugar.

That may seem simple, but it is of great importance that we should understand it, because, as we shall see, two elements can be made, in certain circumstances, to unite in a special way which is very much more than mixture, and to produce something which is absolutely different from either of them, just as much as if when you mixed sugar and ground rice they both disappeared, and you found yourself with a lot of water in the cup instead. That would be more than a mixture, would it not? Something must have happened very different from simply pouring two things out of two bags into one cup, and that is all you need do to make a mixture.

WHAT A MIXTURE IS AND WHAT A MIXTURE IS NOT

Now, the air is simply a mixture of elements. It is as if you took a quantity of one element in the form of a gas, made of tiny little specks called atoms—which we shall talk about soon—something like the grains of sugar or rice, and then to that you added a quantity of another element in the form of a gas, so that the tiny grains or atoms of which it was made just mixed with the atoms of the first element. It is as if you had black marbles in one pocket and white marbles in another, and you took them out and put them into a different pocket together. The black marbles would still be black, and the white marbles white, and you would simply have a mixture of black marbles and white marbles.

Now, this simple fact, that the air is just a mixture of gases, took men an exceedingly long time to find out, and it took them still longer to believe; and even now, though people know that there are different kinds of stuff in the air, they are very often slow to understand that these kinds of stuff are simply mixed, and nothing more. And even in careless books, sometimes, you will find the facts wrongly stated, so as to suggest that the air is not merely a mixture of gases, but something quite different, which we may as well know the name of now; it is called a *compound*. But that is not so; the air is not a compound. If the air were a compound, none of us could breathe it, and so we should not be here to have any opinions about it, right or wrong. Fortunately, it is only a mixture, and the particular element which the air contains, and which we require, can be readily obtained by us without any difficulty.

THE TWO GASES THAT MAKE UP THE AIR WE BREATHE

This same element is found in water; indeed, as we shall see, water is very largely made of it, and could not be water without it. But if we had to get this element, which is called oxygen, from water, we should die at once, for water *is* a compound, not a mixture; and if you want to get an element out of a compound, you will have to do very special things and take great trouble.

There are two elements which make up nearly the whole of the air; their names are *oxygen* and *nitrogen*, and they are not really *combined*, but *mixed*, like the marbles in your pocket. Oxygen and nitrogen can be combined in various ways, but in these cases they make something quite different—which is not oxygen, not nitrogen, and certainly not air. The best-known thing which is made out of oxygen and nitrogen when they are combined is called laughing-gas, which the dentist gives you so that you shall feel no pain when you have a tooth drawn.

I name the oxygen first, though the air is not an equal mixture of these two elements, and though, indeed, there is far more nitrogen than oxygen in it; but the oxygen is far more important,

though there is less of it. Just about one-fifth of all the air consists of oxygen, and just about four-fifths consists of nitrogen. Of course, these are only rough proportions, because, as a matter of fact, there is a tiny quantity of many other elements in the air helping to make up the mixture.

THE LAZY ELEMENT THAT KEEPS BY ITSELF, EVEN IN A CROWD

But though these elements are very interesting, yet they do not do anything in particular, and so they do not matter much to us. I will only tell you that one of them—perhaps the best known—is called *argon*, which means *lazy*, because, though, of course, it will *mix* with anything, it has never yet been made to *combine* with anything, but always keeps by itself, so to say, even when it is in a crowd. That is why it is called lazy.

But before we leave the air, I must just tell you a word or two about the nitrogen and oxygen in it. Though about four-fifths of the entire air is made of nitrogen, yet this element, as it exists in the air, is not very important in itself, for it does practically nothing. Very different is the nitrogen that exists in the earth, where it is also found, for in the earth it helps to build up the bodies of animals and plants, and without it there could be no life.

But practically all that the nitrogen in the air does is merely to dilute or weaken the oxygen, just as you dilute strong medicine by adding a lot of water to it. If all the air, instead of only one-fifth part of it, were made of oxygen, we should scarcely know ourselves.

WE COULD NOT LIVE WITHOUT OXYGEN, NOR COULD WE LIVE WITH TOO MUCH

Oxygen, as we have learned in the CHILD'S BOOK OF ITS OWN LIFE, beginning on page 61, is the element which all animals and plants breathe in order to keep alive. Without oxygen they would all die at once. And this is true even of the fishes of the sea, which breathe oxygen from the air that has got melted or dissolved in the water. This is quite different, as we shall see, from the oxygen that goes to *make* the water, which the fishes cannot use. If all the air were made of oxygen we should get too much of it into our blood, and we should be probably very excited, and never rest, and live too fast. We should do what a fire does if you blow pure oxygen into it. It burns up like fury. It is quite easy to sift the oxygen out of the air, and collect it, and when men want an intensely hot flame they make something burn with this pure oxygen instead of with ordinary air. Also, sometimes when people are ill, and cannot get enough oxygen from the ordinary air, they are given pure oxygen instead to breathe for a time, and this often helps them greatly.

Well, that is all we need read about air at present. It is mainly a mixture of two elements in the form of gases, but it is an unequal mixture, about four-fifths of it consisting of the element nitrogen, and about one-fifth of the element oxygen. There are also tiny quantities of various other elements which go to make it up.

Now, what about the third thing which the Greeks thought was an element—namely, fire? This was rather a curious kind of mistake altogether, but perhaps if I boldly say that fire is not anything at all, neither an element, nor a mixture of elements, nor a compound, you will think I am talking nonsense.

FIRE IS NOT REALLY ANYTHING AT ALL, BUT ONLY A GLOW

But go and look at a fire and consider. There is the coal, some of it red hot, and there are the flames. Well, red-hot coal is simply coal in a particular state. Almost anything will glow if it is made hot enough. For instance, in the ordinary kind of electric light that we have in houses, the little thread inside glows, but that is simply because the electricity running through it makes it hot. The thread is not burning; indeed, there is no air inside the globe for it to burn with. It simply glows because it is hot.

Then, again, there are the flames of a fire, and the Greeks were enormously interested in flames, because they thought that flames must be alive, owing to the way they move and jump. But a flame is really nothing else than a glowing burning gas. The gases in a flame are, of course, made of elements; they are matter, like the air or a sovereign; but the flame itself is not a new and special kind of element, it

is only what these elements look like when they are burning and glowing. So, plainly, in our list of the elements we cannot count fire at all.

And now we come to the fourth of the things which the Greeks thought were elements, and that is *water*. This is, of course, one of the most wonderful, interesting, and important things in the world, though it is so common. I know we are apt to think that when a thing is common it cannot be wonderful. We fancy that the only things really wonderful are those that are very rare.

THE GREAT WONDER THAT LIES IN COMMON THINGS EVERYWHERE

But the man who thinks only rare things wonderful is stupid. One of the greatest men who ever lived, a man to whom every human being owes much for his wonderful discoveries, the Frenchman, Pasteur—for whose sake the whole world is indebted to France, and whose name ought to prevent us from talking nonsense about Frenchmen—said that "everything is wonderful"; only, of course, he said it in French, *Tout est miracle*. The greatest men who have ever lived and the men who have done the greatest deeds are the men who have seen the wonder in common things. The great English poet Wordsworth, who was writing just a century ago, and who made a revolution in poetry, so that all English poetry since him has been a different thing, was great because he never lost the power of seeing the wonderful in everything. Children have this power, and they keep it until they go out into the hard world, or until they meet people who tell them not to ask questions. Here we may give a moment to two quotations from Wordsworth, and when we come to study the wonderful common thing called water, let us remember them.

THE WONDER OF WATER, OF WHICH MOST LIVING THINGS ARE LARGELY MADE

Writing of a man, Wordsworth said:

> A primrose by the river's brim
> A yellow primrose was to him,
> And it was nothing more.

And at the end of what is, perhaps, his greatest poem, in which he tells us how, as a child, he felt the future within him, he says:

> To me the meanest flower that blows can give
> Thoughts that do often lie too deep for tears.

We have to learn that there is nothing common or unclean, and that even ordinary water, though it is one of the commonest things, is also one of the most wonderful things in the world. It is to be found everywhere. There is a vast quantity of it in the air in the form of a gas or water-vapour; enormous quantities of it occur in the form of ice in the neighbourhood of the two Poles of the earth—the North Pole and the South Pole. In its liquid form it covers three-fifths of the entire surface of the globe. Fully three-fourths of the entire substance of our own bodies consists of it, and this is practically true of all living creatures.

There could be no life without water. Most of the changes that occur on the surface of the earth are due to the action of water. There are very few forms of matter, indeed, which will not melt or dissolve in water to some extent; and this applies not only to solid things like sugar, and to liquid things, but also to gases.

WATER IS MADE UP OF SIMPLER THINGS THAT ARE NOT WATER

One of the most important questions about the planet Mars is as to the presence of water there; and one of the most important facts about the moon—a fact which explains why the moon is lifeless, and why scarcely anything ever happens on its surface—is that there is no water on it.

For many ages men believed that water was an element. There was no reason to believe that water could ever be split up into anything simpler. But we now know that water is not an element, and few more important discoveries have ever been made than this.

The truth is that water is made up of simpler things which are not water. Now, the first thing that will occur to you is perhaps that water, like the air, is a mixture. Obviously, it is not a mixture of gases, for a mere mixture of gases would itself be gaseous, as the air is; but perhaps it is a mixture of liquid things, just as milk is. But this is not so. *Water is neither an element nor a mixture*, but is what is called a *compound*, and as most of the things of which the earth is made are compounds, we must be sure we understand what this means before we go any further.

The next story of the earth begins on 1039

CHILD LIFE IN COLONIAL DAYS

You boys and girls who live in the United States to-day will probably think the life of the children of two hundred years ago a very hard and dull affair. But though our Colonial ancestors in their childhood days had fewer toys, fewer privileges and less freedom than the boys and girls of to-day, it is not at all certain that they were less happy. Although governed very strictly, and whipped not infrequently, we fear, from the records that come down to us, that they were not always good. In this article we will learn of the sharp discipline administered to naughty children by stern schoolmasters and not less stern parents; we will hear how the tithing man rapped their heads when they were restless in church and indignantly tickled their noses when they fell asleep during the four-hour sermon; we will see the children in the school and at home, in the village meeting house and at their sports in different parts of the country; and, by and by, because this article necessarily deals chiefly with boys, we will find in another volume an article upon The Little Girls of Long Ago.

Have you ever thought how much is done for children in these days? The school is often the most costly building in the town; thousands of books are printed for you, toys are made by the million, and amusements of every kind are provided for you. This was not the case when our country was young. Then children were "expected to be seen and not heard," and they were expected also to obey without any question.

Parents loved their children then as much as they do now, but they were afraid of spoiling them by too much indulgence. In the earliest days of the colonies life was hard for everyone, and children had to do without things as well as everyone else. Yet these children were not unhappy and not all of them were good in spite of the severe punishments. Let us see how these children lived and how their life differed from that of their descendants in our country to-day.

SNORRO AND VIRGINIA DARE

The first child born in America was the little Norseman, Snorro, who was born in 1007, as we learned in another story. He went back to Europe when three years old, however, and so hardly counts as an American child. There were doubtless Spanish children born at St. Augustine, which is the oldest town in the United States, but the next child of whom we shall speak was the first English little one born in our country. This was little Virginia Dare, born in 1587, on Roanoke Island, now a part of North Carolina. Here Sir Walter Raleigh was trying very hard to found a colony. Before little Virginia was three years old the colony disappeared, and no one knows to this day what became of it. We shall tell in another place all that is known of the "Lost Colony of Roanoke."

Years after this a small ship called the Mayflower was crossing a cold and wintry sea with a little band of Englishmen seeking homes in the new land. Two new baby boys had been added to their number, and almost everyone on board ship was crowding into the dark little cabin, anxious to help the parents to choose names for the tiny fellows. It was at last decided that they should be called Oceanus and Peregrine, which latter means wandering, since the children had been born in mid ocean near the close of their long wanderings.

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"Oceanus! Peregrine! What very odd names for children!" you exclaim. Yes, indeed, and very odd names most of the children were given who were born in New England in the days of long ago. Parents searched for names that had a deep religious meaning, or that showed the conditions under which the little ones had come into the world. Large families were the rule in those days, sometimes as many as fifteen or twenty children. Many of them bore such names as Deliverance, Temperance, Endurance, Silence, Believe, Faith, Tremble, Preserved and so on.

But if the names were strange the manner of their bestowal seems far more so. "Half the Puritan children had scarce drawn breath in this vale of tears ere they had to endure an ordeal which might well have given rise to the expression, 'the survival of the fittest.' All had to be baptised within a few days of birth, and baptised in the meeting house. We can imagine the January babe carried through the narrow streets or lanes to the freezing meeting house which had grown damper and deadlier with every wintry blast; to be christened, when sometimes the ice had to be broken in the christening bowl. It was a cold and disheartening reception these children had in the Puritan church; many lingered but a short time there. Indeed from the moment when the baby opened his eyes on the bleak world around him, he had a Spartan struggle for his life." Those that survived were usually very hardy. As soon as a child was two or three years old his small shivering feet were daily dipped into a tub of icy cold water to make them tough. Many parents for the same reason believed that their boys should wear shoes "thin enough that they may leak and let in ye water."

Schooldays in the Colonies

At first in most of the colonies there was little regular education of the children. The boys learned at home how to read and write and the girls to sew, but there were no schools; the men were too busy making homes and providing food for their families to think of the matter. But in the hearts of our forefathers was a deep-seated reverence for education and presently people began to build schoolhouses. Then here and there, wherever there were towns, schools were started. In Massachusetts every town of fifty families was compelled by law to keep a school for boys, but nothing was said about girls. The buildings sometimes were small, uncomfortable log cabins; the books were few and tiresome, and the schoolmasters were often not good teachers. Yet nothing could weaken the ambition of the parents to have their children educated. "Child," said one noble New England mother of long ago, "if God make thee a good Christian and a good scholar. 'tis all thy mother ever asked for thee."

So the children, whether they wished it or not, were packed off bright and early each morning to the schoolhouse. with their spellers or their arithmetics tucked under their arms. The rules for one school in New England required school to begin at seven o'clock in summer and at eight in winter. The older boys and girls sat at rude desks made of boards, resting on pegs driven into the floor, which was sometimes of earth. The younger scholars sat on blocks or benches of logs.

The Pedagogue of Long Ago

Usually the boys and girls began in a school kept by a woman in her own home. Then the boys were transferred to a school kept by a man, for at first little attention was paid to the education of girls beyond reading and writing. In New England the ministers were often teachers as well. The same was true of some parts of the South. They were usually college graduates, taught Latin and Greek well, and were much respected. In other colonies the position of the teacher was lower. Once in New York, the town council advertised for a man to act as clerk, serve as sexton of the church, ring the bell, dig graves,

lead the singing in church, and teach the children.

The appearance of one of the schoolmasters of "ye olden days" is thus described: "He wore a tabby velvet coat, the tails of which stood sometimes straight out. Inside the coat was a waistcoat of tremendous length, through which showed conspicuously the nicely starched ruffles of his white shirt. His knee breeches of velvet like his coat, were finished at the knee by large and shining silver buckles. With these in luster, vied two more silver buckles which rested on the top of his clumsy shoes. Around his neck was wound, just once and a half, a stiffly ironed stock, which helped to keep his head stiff and straight as became a teacher in his day. But above all, his crowning glory was his wig, the white powdered wig, combed straight back from his forehead, and hanging always in a nicely braided queue behind."

To modern boys and girls the children's clothes would seem every bit as odd as those of the schoolmaster. The girls were arrayed in stiff homespun linsey-woolsey petticoats and bodices. Linsey-woolsey was a rough cloth, half linen and half wool. About their throats they wore white kerchiefs and at their wrists white cuffs. The Puritan maidens wore demure little caps such as you can see in any picture of the Pilgrim mothers. The boys wore knee breeches, long waistcoats and heavy coats with wide pockets and wide turn-over cuffs. The children of well-to-do parents who were not Puritans, frequently wore ruffles of fancy white linen at their necks and wrists.

Sometimes boys were sent away from home to a relative who lived near the school and providing a suitable wardrobe was difficult problem. One old lady who was boarding her grandson during the school term wrote home to his father in deep distress. "Richard weares out nigh twelve paires of shoes a year. He brought twelve hankers with him and they have all been lost long ago; and I have bought him three or four at a time. His way is to tie knottys at one end and beat ye boys with them & then to lose them & he cares not a bit what I will say to him."

School opened with prayer, after which the children began their reading, writing, spelling, or arithmetic lessons as the case might be. Lead plummets were used instead of pencils, and the children did their sums, or copied their writing into note books made of foolscap paper sewed into book shape and carefully ruled by hand. "Among the thrifty Scotch-Irish settlers in New Hampshire and the planters in Maine, sets of arithmetic rules were copied by each child on birch bark."

At eleven o'clock the bell rang for recess and the children, delighted to stretch their legs and shouting to each other as they ran, scampered off home, not to return until one o'clock. Those who lived too far away brought their dinner, just as some children do in the country now. The afternoon session lasted until four and school closed as it had opened with prayer. On Wednesdays and Saturdays they learned and recited the catechism, or the prayers from the prayer book, in some colonies.

Methods of Discipline

"Spare the Rod and Spoil the Child," was the motto of every parent and every teacher. The discipline in the school was very severe. Boys who did not learn their lessons or were impertinent to their master were soundly flogged and, as this happened not infrequently, the school room continually resounded with the swish of the birch rod. Often, too, our stern great-grandfathers whipped their sons because they had been whipped at school. Children were taught to obey their parents according to the commandment, without arguing and objecting. An early law of Connecticut fixed the penalty of death upon any son who should strike his parent.

In the "Dame Schools," as the schools kept for little folks by a woman were called, some of the methods of punishment were quite novel. The

schoolmistress would go about among the benches and briskly tap the heads of idle children with a heavy thimble she always wore on her finger. Lying was punished by applying hot mustard to the tongue of the offender; whispering met the unpleasant fate of being gagged with a small wooden board; stupid children were made to stand upon a tall "Dunce" stool, and any child who was so wicked as to be guilty of stealing had his small fingers burned with red hot coals. Among other modes of punishment were strapping tender hands with leather thongs with holes in the middle, and pinching the ear lobes and noses of naughty children with pieces of wood, shaped like clothes-pins. In some of the schools, good and industrious children sometimes received such rewards of merit as a portion of a strawberry divided among three or four scholars, or had a red, pink or blue bow tied to their shoulders to wear home to show their proud parents. In schools where these last were used a black bow was pinned upon the naughtiest child, with the consequent whipping to be administered at home.

A writer of 1750 says, in commenting on his schooldays: — "When I was three years old, I was sent to school to a mistress, where I learned to read with neat dispatch; in my fifth year, I was taken away and put to a writing master. In my seventh year, I flourished a tolerable hand and began my grammar. By the time I was fourteen I was considerably proficient in the Latin and Greek languages and was admitted into Harvard." Perhaps it was owing to the early age that our ancestors were sent to school, and the fact that they entered college while mere boys that corporal punishment was in vogue in the higher educational institutions.

Students at college were often publicly thrashed. Among the rules of Harvard University published in 1660 was this: —

"It is hereby ordered the president and fellows of Harvard College have the power to punish all misdeeds of the young men of their college. They are to use their best judgment and punish by fines or whipping in the hall publicly, as the nature of the offense shall call for."

That such punishment was not always wholly undeserved is shown by the following grim comment upon misdemeanours of students in the above college: —

"M——, H—— & W—— were expelled from college and their names cut out of the tables in the dining-room by order of the president of the college; this was done before all the fellows interested. It was because of the disorder and bad actions of these three young men towards Andrew Belcher. They killed Grandma Sell's dog and stole ropes with which to hang him. They hung him upon a sign post at night, as one of them afterwards confessed before the college authorities and before his comrades. And at the time it was not denied in any way; but two of the students afterwards had the third one say that after all that what he had related was not true. Many great lies were told by all of them and especially by one. And there were many reasons for the belief that they committed these crimes."

Tutors in the South

In the South there were few towns, and the people lived on plantations, often at some distance from neighbours. Therefore it was common for planters to employ tutors for their children. These private tutors were often of a much higher grade of intelligence than the teachers at the schools, as they were usually college graduates or students. Often the owner of a Southern plantation would hire a tutor for his sons and daughters, and invite the parents on neighbouring estates to send their children.

Here is an interesting extract from the diary of a young Princeton graduate who went down to Virginia to be the tutor of the children of the wealthy Carter family in 1773.

"Monday, November 1st. We began school. The school consists of eight. Two of Mr. Carter's sons, one

nephew and five daughters. The eldest son is reading Sallust; grammatical exercises and Latin grammar. The second son is reading English grammar and reading English writing, and ciphering in subtraction. The nephew is reading and writing as above: and ciphering in reduction. The eldest daughter is reading the Spectator, writing, and beginning to cipher. The second is reading now out of the spelling-book, and beginning to write. The next is reading in the spelling-book. The fourth is spelling in the beginning of the spelling-book. And the last is beginning her letters.

"In the morning so soon as it is light a boy knocks at my door to make a fire, after the fire is kindled, I rise which now in the winter is commonly by seven or a little later. By the time I am drest the children commonly enter the schoolroom, which is under the room I sleep in. I hear them round one lesson, when the bell rings for eight o'clock (for Mr. Carter has a large good bell which may be heard for some miles, and this is always rung at meal times); the children then go out; and at half after eight the bell rings for breakfast, we then repair to the dining-room; after breakfast, which is generally about half after nine, we go into school, and sit till twelve when the bell rings, and they go out for noon; the dinner bell rings commonly about half after two, often at three, but never before two. After dinner is over, which in common, when we have no company, is about half after three we go into school, and sit till the bell rings at five, when they separate till the next morning. We go into supper commonly about half after eight or at nine, and I usually go to bed between ten and eleven.

"Saturday, December 18. After breakfast, we all retired into the dancing-room and after the scholars had their lesson singly round Mr. Christian, very politely, requested me to step a minuet; I excused myself, however, but signified my peculiar pleasure in the accuracy of their performance. There were several minuets danced with great ease and propriety; after which the whole company joined in the country dances; and it was indeed beautiful to admiration, to see such a number of young persons, set off by dress to the best advantage, moving easily to the sound of well performed music, and with perfect regularity, tho' apparently in the utmost disorder. The dance continued till two, we dined at half after three. Soon after dinner we repaired to the dancing-room, again. I observed in the course of the lessons, that Mr. Christian is punctual, and rigid in his discipline, so strict indeed that he struck two of the young misses for a fault in the course of their performance, even in the presence of the mother of one of them. And he rebuked one of the young fellows so highly as to tell him he must alter his manner, which he had observed through the course of the dance to be insolent, and wanton, or else absent himself from the school."

CHILDREN'S WORK IN THE OLD DAYS

But all children were not so fortunate as those on Southern plantations. In New England and in other parts of the country as well, the children at a very early age were expected to do their share of the house and farm work. Captain John Smith wrote before there were any children in New England: — "He is a very idle boy who has passed the age of twelve years and cannot do as much; and a girl is very stupid who cannot spin a thread to make nets to catch the fish. What pleasure can be greater, when people are tired with work on shore, whether they have been planting vines, or building houses or ships, than to get recreation for themselves before their very doors, in their own boats upon the sea. There man, woman and child, each with a small hook and line, may take divers kinds of excellent fish at their pleasure. And is it not a pretty sport to pull up two-pence, six-pence, and twelve-pence as fast as you can haul and change a line? He is a very bad fisher who cannot take one day with his hook and line one, two or three hundred cods. These,

dressed and dried, if they be sold here in New England will bring ten shillings for a hundred; or in England, more than twenty. If a man work but three days in seven he may get more than he can spend unless he is very wasteful."

You must remember many of the things which we now buy in the shops were then made at home. The mother then spun the wool or flax into thread, and wove it into cloth and made the clothes for the family. She knit the stockings and even made hats. She pickled and preserved, dried fruit, and even made the soap and candles for family use. In this she was of course helped by her daughters, who had their work given to them when very young.

The father was a farmer, and often carpenter, tanner, shoemaker and blacksmith as well. The boys had their work here also as soon as they were able to help. Such a state of things always exists in a new country and in some parts of the United States has not entirely disappeared yet.

COLONIAL SABBATH

In New England the observance of Christmas Day was forbidden as "unseemly to ye spiritual welfare of ye community." William Bradford, governor of the colony of Plymouth, grimly commented upon the first Christmas.

"The day called Christmas Day, the governor called them out to work (as was used), but most of this new company excused themselves and said it went against their conscience to work on that day. So the governor told them that if they made it a matter of conscience he would spare them until they were better informed. So he led away the rest and left them; but when they came home at noon from their work, he found them in the street at play openly, some pitching the bar, and some at stool ball and such like sports. So he went to them and took away their implements and told them it was against his conscience that they should play and others work."

"But," you perhaps are thinking, "there was at least one day of the week in which the children could be free from the discipline of parents or schoolmaster" — and you remember the many pleasant Sunday afternoons of your own happier life. But Sunday for the boys and girls of New England was a day of restraint. The Puritans brought with them to this country a fixed idea that the first day of the week, the Sabbath, should be strictly observed. Even in Virginia and New York, where the people were more or less easy going, there were rigid laws for the ordering of one's conduct on the Sabbath Day. "In Massachusetts the law provided that no person should be permitted to walk in the streets on Sunday, except in reverently going to church or returning from the services."

Both at the North and at the South, it was the custom to have two or three religious services during a single Sunday with a long recess at noon for luncheon. In New England and some of the other colonies there were little houses or shanties built near the meeting house, so that people might be kept warm and dry during dinner. These were called "Noon Houses." You can well imagine that the children did not find Sunday a welcome day.

The Sabbath began in New England at sunset on Saturday afternoon, when all work was stopped and the children's play hushed, to prepare their minds for the coming of the Sabbath. Next morning the whole family arose early. No work, except such as was absolutely necessary, was done. The dishes were left unwashed until Monday morning. Whether the weather was stormy or fair, the entire household, save the tiniest children and some one to mind them, set out for the meeting house, usually a good many miles distant. As they approached the meeting house through the woods, their Bibles under their arms, the men often carrying their guns, they could hear the muffled beat of a drum through the Sabbath hush. It was the call to prayer.

When they entered the church the children were separated from their parents, the boys going into one pew

and the girls into another. The service was a long one, the sermon sometimes lasting three or four hours. Do you wonder that the boys got restless and the girls sleepy? But woe betide the unlucky child who chanced to close his eyes. All of a sudden down would come the tap, tap, of a knobby pole upon his head. It was the "tithing man," whose duty it was to keep order during the church service. Now he tickled the face of a sleepy little girl with the fox-tail on the end of his pole, now he smartly rapped the skull of an unruly small boy. That the boys were unruly is proven by the records of their time. One reads, thus: — "We of Medford do pass an order that all small boys who cut the seats in the meeting house shall be persecuted." Tithing men and constables were appointed especially to watch over the "pue of ye wretched boys" to "see that they behave comlie, and use such raps and blows as shall be meet." Another record reads: — "His majesty's Tithing man entered complaint against Jona and Susan Smith, that on the Lord's Day during Divine Service they did smile. They were found guilty and each was fined five shillings and costs."

At five o'clock the long day of service was at an end and the family solemnly made their way homeward. There were Sabbaths when the snow was white and thick on the ground, and the air was crisp and clear that proved a "temptation of ye Devile" to many boyish hearts and they fell by the wayside and went "sleeing." This roused the deep wrath of the Albany authorities and they passed a law forbidding such "unseemly wickedness."

"Whereas the children of the said city do very unorderly to the shame and scandal of their parents, ride down the hills in the streets of the said city with small and great sleds on the Lord's Day . . . now for preventing the same it is hereby published and declared it shall and may be lawful for any constable in this city to take any such sled or sleds from all and any such boys and girls riding or offering to ride down any hill within the said city and break any sled or sleds in pieces."

Moreover it was ordered that the officer seize the cloak or upper garment of the offenders and present them to the parents to be redeemed on the payment of a fine of five shillings.

MANY KINDS OF GAMES

The games played by the children were different in different sections of the country. But Puritan children were brought to look upon wholesome games and frolic as deadly sin. Football, especially dear to boyhood hearts, was pronounced a game "wherein is nothynge but beastlye furie and exstreme violence." The Dutch settlers had many games, however. They were very fond of bowling on the grass. A well known little park in New York, Bowling Green, shows the popularity of the game, that was played there. They also played "tick-tack," a complicated sort of backgammon and "trock," on a table somewhat like a billiard table, in which an ivory ball was struck under wire wickets with a cue. Coasting down hill became a popular sport. The sleds were low, with a rope in front and were started and guided by a short stick. The children played with marbles, tops, hoops, kites, balls, even as do the boys and girls of to-day. Such familiar games as prisoner's base, hop scotch, tag and leap frog were well known. Running about on stilts was a favourite diversion.

In the South as in New York good times were more common. Dancing was considered a very important thing to know. Our forefathers, however, knew nothing of round dances. The stately minuet, the quadrille, the Virginia Reel, and a number of "country dances" were among their favourites. The young tutor, a bit of whose diary we read under "Tutors in the South," writes thus of Virginia days: — "Nothing is now to be heard of in conversation, but the balls, the fox-hunts, the fine entertainments, and the good fellowship, which are to be exhibited at the approaching Christmas. Mr.

Goodlet was barred out of his school last Monday by his scholars, for Christmas holidays, which are to continue till twelfth-day; but my scholars are of a more quiet nature, and have consented to have four or five days now, and to have their full holiday in May next. When the candles were lighted, we all repaired into the dancing-room; first each couple danced a minuet; then all joined as before in the country dances, these continued till half after seven, when at the proposal of several, we played Button, to get pawns for redemption: here I could join with them, and indeed it was carried on with sprightliness, and decency; in the course of redeeming my pawns I had several kisses of the ladies! Half after eight we were rung in to supper. The room looked luminous and splendid: four very large candles burning on the table where we supped; three others in different parts of the room; a gay, sociable assembly, and four well instructed waiters. So soon as we rose from the supper, the company formed into a semi-circlet round the fire, and Mr. Lee, by the voice of the Company, was chosen Pope, and the rest of the company were appointed Friars, in the Play called 'Break the Pope's Neck.' Here we had great diversion in the respective judgments upon offenders, but we were all dismissed by ten, and retired to our several rooms."

In the South the boys had much healthful out-of-door sport. They went hunting with the negro men and learned the habits of the birds and animals. They were taught to shoot, to fish, and when they grew older went fox-hunting with their elders.

SWEETMEATS

But Southern boys and girls were not the only Colonial children to whom life had its compensations. In the seaport towns sweetmeats seem to have been plentiful. Ships brought in an abundance of sugar and molasses, chocolate and ginger into all the ports. One Colonial shop bore this quaint sign upon its door:

"I have Sucket, Surrip, Grene Ginger and Marmalade
Bisket, Cumfet, and Carraways as fine as can be made."

Apparently such toothsome dainties were far more common in the Colonies than in England, for one writer says that it was in these long ago days that the foundation was laid for the "American sweet tooth — a wonder!" Then too the colonists learned very early to make maple syrup and maple sugar, and you may be sure that the children had their share of these. "Boys and girls who were fortunate enough to live in coast towns reaped the sweet fruits of their father's foreign ventures. When a ship came into port with eighty boxes of sugar candy on board and sixty tubs of rock-candy, poor, indeed, was the child who was not surfeited with sweets. There was a sequel, however, to the toothsome feast, a bitter dessert. The ship that brought eighty boxes of sugar candy also fetched a hundred boxes of rhubarb and ten of senna." And you may be sure the wise parents did not spare the bitter dose.

The value of a medicine was then judged according to its bitterness. Nowadays the effort is made to make all medicines tasteless. The little gelatine capsules which conceal the bitter or nauseous dose had not then been invented. Many of the medicines given were herbs such as tansy, thoroughwort, sage and pennyroyal. A mixture of sulphur and molasses was supposed to be good for the blood, and the other doses were hardly less unpleasant.

ARE CHILDREN HAPPIER TO-DAY?

Though it seems that the life of the children about whom we have just read was not very interesting, on the whole they were probably happier than children to-day. They did not have so many toys, and so much was not done for them, but they knew how to get pleasure out of simple things, and the simple pleasures are, after all, the sweetest. They did not expect to have every whim gratified, but gratified others, and there is more pleasure to be found in doing things for others than in having things done for us.

MORE ADVENTURES OF DON QUIXOTE

THE adventures of Don Quixote are told in a very long book, much longer than most stories of the present day, and as it abounds in incidents, the imagination of the author being almost without limit in the invention of comical episodes, in which his ridiculous but gentle-hearted hero usually comes to grief, only a few of these can be told here. We read on page 900 of the first journey of Don Quixote and his inglorious return, but now, in company with Sancho Panza, his squire, he has taken the road again, and we are to follow him in his new adventures.

DON QUIXOTE AT THE WINDMILLS
And the Adventure in the Lion's Cage

CONTINUED FROM 902

WHILE Sancho was talking as they went along, about the island he was going to govern—he was not quite sure, by the way, what an island was—they came to a plain on which were some thirty or forty windmills.

"Look yonder, friend Sancho!" cried the knight. "There are at least thirty outrageous giants whom I intend to encounter. Having deprived them of life, we will enrich ourselves with their spoils, for they are lawful prize."

Honest Sancho, who saw things as they were, endeavoured to convince his master that the "giants" were really windmills. But Don Quixote, regarding this as a sign of magic, told Sancho to stand aside if he was afraid.

This said, he put spurs to Rozinante, and crying out, "Stand, cowards! Be not so base as to fly before a single knight, who dares encounter you all!" was about to charge.

At this moment the wind arose, and the mill-sails began to move.

"Base miscreants!" now cried Don Quixote. "Though you move more arms than the giant Briareus, you shall pay for your arrogance."

Calling upon his Lady Dulcinea, he couched his lance, and, covering himself with his shield, dashed forward to the nearest windmill at the utmost speed of which Rozinante was capable. As he ran his lance into the sail, the wind whirled it about with such swiftness that the lance was shivered, and both knight and horse were hurled to the ground. As on the former occasion, the knight was again rendered powerless.

When Sancho ran up to him, Don Quixote declared that a wicked magician had transformed the giants into windmills, so as to deprive him of the honour of the victory. Don Quixote's next adventure was of a more dignified character. Engaging in single combat with a Biscayan, he had him at his mercy, and only spared his life when his lady promised that he should go to Toboso and present himself before the Lady Dulcinea that she might dispose of him as she might think fit.

But not long after this, as the result of an encounter with a party of carriers, Don Quixote was seen riding in a limp condition on Dapple, while Rozinante carried his arms, and Sancho Panza, also sorely bruised, was leading the way to an inn, on seeing which Don Quixote declared it was a castle. Here the knight's conduct caused much wonderment, but his wounds were attended to, as were those of his squire.

On being informed by the landlord at the moment of leaving that his imagined castle was but an inn, Don Quixote declared that as no knight-errant had ever been known to pay in such a place, neither would he. Thereupon he rode off. But Sancho Panza, who was behind, was seized and tossed in a blanket, and emerged from this adventure more wretched than his master, who, hearing his squire's cries, came back, but was unable to help him.

As they went on their way, Don Quixote sought in vain to convince Sancho that those who had treated him so cruelly were but phantoms from another world.

"It is as plain as a nose on a man's face," declared Sancho ruefully, "that these adventures, which we hunt for up

DON QUIXOTE TILTING THE WINDMILLS

and down, are like to bring us at last into a peck of troubles. Our wisest course is to jog home and look after our harvest, lest worse mischief befall us."

"Poor Sancho," replied the knight; "how ignorant art thou in matters of chivalry! Come, say no more, but have patience. A day will come when you will be convinced how honourable a thing it is to follow this employment."

So, but with reluctance, Sancho rode on with his master.

Soon after this Don Quixote performed a feat of valour which astonished all. Encountering a waggon, in which two fierce lions were being conveyed to the king, he called upon the keeper to open the cages and let the animals free.

"In spite of the enchanters that have sent them to try me," he cried, "I will make the creatures know who Don Quixote de la Mancha is."

When all save the keeper had fled out of harm's way, and the mules that drew the waggon had, with Rozinante, been taken to a place of safety, the knight compelled the keeper to open one of the cages.

Grasping his shield in one hand and his sword in the other, he then took

SANCHO PANZA TOSSED IN A BLANKET

up a position before the cage. The door being set open, a large lion was disclosed to view—an animal that appeared of a monstrous bigness and fearful aspect.

The first thing the lion did was to turn himself round in his cage, stretch out one of his paws, and rouse himself. After that he gaped and yawned, then thrust out his tongue. Then, lifting his head, he stared about with eyes that looked like two live coals. But Don Quixote stood undaunted, and, as the lion turned round and showed his back to the knight, called upon the keeper to rouse the animal with blows. The keeper advised the knight to be satisfied with his day's work, having displayed his courage sufficiently.

Persuaded at length that, as the challenger, he could do no more, Don Quixote yielded to the man's appeal, insisting, however, that the keeper should give him a certificate of what he had seen performed.

"Well, Sancho," said Don Quixote to his squire afterwards, "what make you of this? These magicians may perhaps rob me of success, but of fortitude and courage they cannot deprive me."

HOW SANCHO PANZA BECAME A GOVERNOR
And the Sad Adventures that Befell Him

ONE day at sunset, as the knight and his squire were coming out of a wood, Don Quixote saw a noble cavalcade, composed of a duke and his lady and their retainers. It was a hawking party. The knight sent Sancho forward to pay his respects to the lady, and to say that the Knight of the Lions, as he now proclaimed himself, would be proud to receive her command.

Now, it happened that the lady had heard of Don Quixote's remarkable adventures, and she received Sancho with great courtesy, Don Quixote and his squire being invited by the duke and duchess to their castle. Learning the knight's story, the duke resolved to gratify Sancho Panza's ambition to be a Governor and to rid Don Quixote of his foolish humour.

With this end in view he arranged a pageant, which he and his guests came upon one day as if by accident. In this pageant there rode a beautiful damsel, by whose side was a terrible-looking figure representing a magician. When the procession stopped, the magician, drawing himself up, declared that the damsel by his side was none other than the Lady Dulcinea, and that there was but one way by which she could be released from her troubles. This was that Sancho, who had played a trick upon his master by presenting to him a country woman as his beautiful Dulcinea, should inflict upon himself 3,300 lashes.

Upon hearing this Sancho loudly bewailed his fate, and declared that his master should bestow the lashes upon his own person. Overcome, however, by the protests that arose against his cowardice, Sancho consented to perform the penance, if he was appointed to the governorship and was allowed to give himself the stripes when he pleased.

That night Sancho gave himself five slaps with the flat of his hand. Some days later, Don Quixote, taking Sancho aside, imparted to him some wise counsel respecting his conduct as Governor.

After this Sancho was conducted by the duke's steward to the seat of the governorship, which was known as the Island of Barataria. When he came to the gates of the town, he was met by the officials, and the people gave demonstrations of joy. His first duties took him to the Hall of Justice, where he had to judge a number of cases. He was next conducted to a sumptuous palace, where arrangements had been made for a Royal feast. When the music had ceased, Sancho took his seat at one end of the table, which was only laid for one.

An official, who appeared to be the Court physician, came and stood at his elbow, with a wand of office in his hand. One that looked like a student said grace. A page put a laced bib under the new Governor's chin. Then another servitor placed before him a dish of fruit. But Sancho had hardly tasted this, when the physician touched the dish with his wand, and it was taken away in an instant.

This happening several times, the amazed Sancho asked if he was expected to eat his dinner like a juggler.

"My lord Governor," answered the man with the wand, "you are to eat here no otherwise than according to the use of other islands where there are Governors. I am a doctor of physic, my lord, and I have a salary allowed me to attend the Governor's meals, to let him eat what I deem good for him, and to remove what I regard as harmful."

After much discussion Sancho asserted his right to eat what he wished. But he wrote a letter to his old master on the woes of office.

One night Sancho was aroused by a fearful din. Hastily jumping up, he was met at the door of his apartment by a body of armed men with swords and lighted torches in their hands.

"Arm, my lord Governor!" they cried. "A world of enemies have got on to the island, and we are lost unless your valour save us!"

They brought him two huge shields, tied one in front and the other behind him, and, putting a lance in his hand, called upon him to lead the way against the enemy. Poor Sancho, directly he attempted to move, fell down as helplessly as did Don Quixote when he rode at the merchant.

Thereupon there was another great uproar, which was followed later by cries of "Victory!" Told that he had caused

SANCHO PANZA AT THE ROYAL FEAST

the enemy to be routed, Sancho asked nothing more than to be unburdened of the huge shields and to be given some wine.

After this he dressed himself, and, going quietly to the stable, followed by the whole company, he embraced Dapple, gave him a loving kiss, and, with tears in his eyes, cried :

"Come hither, my faithful companion. When thou and I were together, and all my cares were but to mend thy trappings and feed thy little carcase, then happy were my days. But since I forsook thee, and clambered up the towers of ambition and pride, a thousand woes, toils, and tribulations have haunted my soul."

With this he mounted his old friend, and rode forth to liberty, remarking that a man should stick to the calling he was born to, and that he would rather eat a mess of plain porridge than be at the mercy of a physician who starved him.

DON QUIXOTE AND THE CLOUDS OF DUST
The Adventures with the Armies of Sheep

As they continued on their way, they saw a thick cloud of dust arise before them.

"The day is now come," said Don Quixote, on seeing this. "The day is come, Sancho, that shall usher in the happiness that is in store for us. That cloud is raised by a great army on the march."

"Why, then," said Sancho, "there must be two armies, for yonder is as great a dust on the other side."

Don Quixote looked and was thereupon transported with joy. His imagination at once leapt to the conclusion that two vast armies were about to engage each other on the plain before them. So clouded was his brain that he could not see that the dust was raised by two flocks of sheep going in the same direction from different parts. The dust being so thick as to hide the cause of it, Sancho at first believed that what his master said was right.

"What shall we do?" he asked, in great alarm.

"Do?" exclaimed Don Quixote. "What but assist the weaker and injured side? The army, Sancho, which now moves towards us is commanded by the great Alifanfaron; the other is his enemy, the King of the famous Garamantians, Pentapolin with the naked arm, so called because he always enters into battle with his right arm bare."

Recalling what he had read from foolish books, Don Quixote proceeded to describe to his squire the causes of the quarrel. At this point they mounted a hillock, from which Sancho, to his amazement, could only see the sheep, which were being driven along by some peaceful countrymen.

"Why," said he, "you might as well tell me that it snows. Not a man, nor a knight, nor a giant such as you name, can I see, but only sheep."

"Dost thou not hear their horses neigh, their trumpets sound, and their drums beat?" asked the knight.

"Not I," replied Sancho; "I can hear nothing but the bleating of sheep,"—for the two flocks were now very near to them.

"Thy fears disturb thy senses," said Don Quixote, "and hinder thee from hearing and seeing right. But since thou art so terrified, withdraw to some place of safety. For I alone am sufficient to give the victory to that side which I shall favour." And so, couching his lance, setting spurs to Rozinante, and heedless of what Sancho Panza said, Don Quixote rushed forward upon the sheep.

"Courage, brave knights," cried he, laying about him with all the vigour possible, "fall on all of you who fight under the standard of the valiant Pentapolin. Follow me, and you shall see how easily I shall revenge him on that infidel Alifanfaron."

Seeing what destruction the knight was causing, the shepherds and drovers who were with the sheep called out to him to desist, and, finding that their cries were of no avail, they proceeded to unloose their slings and to ply him with showers of stones as big as their fists. But Don Quixote only laid about him with greater energy, until one of the stones struck him so violently in the face that it knocked out several of his teeth and caused him to fall heavily to the ground and lose his senses.

As he lay motionless, the shepherds, fearing he was killed, got their flocks together, and, carrying away the dead sheep, of which there were about seven, departed with haste.

When Sancho had come to his master's assistance, Don Quixote, sorely hurt as he was, groaned out that this fresh trouble was again the work of an enchanter, and begged Sancho to follow the sheep, declaring that if he did so he would soon find them resume their former shapes. But Sancho was not to be persuaded this time, and the knight had to yield to his suggestion that they should find their way to a lodging where they might rest.

Shortly afterward knight and squire returned to their native village, wiser, if sadder, than when they first left it. And Don Quixote, dying in his right mind, was deeply mourned by all who knew him, and especially by Sancho Panza.

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CONTINUED FROM PAGE 877.

THE ENCHANTED HORSE

As the Shah of Persia was keeping the Feast of the New Year in the city of Shiraz, an Indian magician came to his Court, leading a very ugly horse. It walked in a jerky way, and looked more like wood than a living creature. The Shah could hardly help laughing when he saw it.

"Laugh as you will, sire," said the magician, "I think you will be glad to pay a great price for my horse when you know what it can do. If your brave young son, Prince Frouz, will deign to mount it, and turn the peg in the saddle, he will be able to test its power."

"Well, let me see what it can do," said the Prince.

He sprang upon the horse, and, without waiting to learn how to manage it, turned the peg in the saddle. The strange animal at once rose with him into the air with the swiftness of an arrow, and carried him out of sight.

At first he was delighted at the speed with which he rushed through the air. He did not grow uneasy until he tried to turn the horse's head back to Shiraz, and found that it would not answer the rein.

"I suppose," he said, "I must twist the peg the other way."

He did so, and, to his alarm, the horse leaped up higher into the sky, and began to travel as fast as lightning.

Prince Frouz did not lose his wits, and after examining the saddle he found another smaller peg. He gave this a wrench, and the horse then stopped, and carried him gently downwards, and he alighted, tired, weak, and hungry, on the terraced roof of a strange, great palace.

It was now night, and everybody was in bed. Prince Frouz crept downstairs, and came into a splendid hall. There he saw a lovely young lady sleeping on a

The Prince sprang upon the horse, which carried him out of sight.

He placed her upon the enchanted horse, and sprang up beside her, and in less than an hour they were at home again.

sofa, with ten women reposing around her. Going up to the sofa, he awoke the lady, and asked her pardon, and told her the story of his wonderful adventure.

"And now," he said, "may I ask, my sweet lady, who you are, and where I am?"

"You are in the palace of the Princess of Bengal," said the lady kindly, "and I am the Princess."

She then called her women and bade them set out a repast for Prince Frouz, and conducted him to a Royal bedchamber. The Prince slept soundly, and rose up fresh and gay of heart, and the Princess sent for him and begged him to tell her again the story of his wonderful adventure. They remained together all day long, and the result was that they fell deeply in love with one another.

At break of day next morning, before anyone else was awake, the Princess climbed to the terraced roof of the palace and found the Prince waiting for her, and they both mounted the enchanted horse and set out for Persia, where they intended to get married. The Prince now knew how to manage the horse, and in a short time he arrived with the Princess at a castle a little way from Shiraz.

Leaving his sweetheart there to array herself in her richest attire for the wedding, he went to his father, the Shah, to tell him of her coming. Unhappily, he left the enchanted horse at the castle instead of taking it with him. While he was telling his father the story of his wonderful adventure, the Indian magician heard what he said, and ran to the castle and got the enchanted horse, and exclaimed to the Princess:

"The Shah wishes to see you at once, and Prince Frouz has asked me to fetch you. Mount with me on the horse, and we shall reach Shiraz in a moment."

The Princess got up beside the magician, and he at once turned the horse's head away from Shiraz, and carried her off to Cashmere. They descended in a road near the chief town of that country, just as the Sultan was riding by.

"Save me!" cried the Princess. "Save me from this wicked man!"

The Sultan of Cashmere was amazed at her loveliness, and with one stroke of the sword he slew her enemy, and then he led her kindly into the stateliest

room in his palace, and commanded a hundred slaves to wait upon her.

"I have escaped from one snare," she said to herself, "and fallen into another."

So she had. The Sultan was wildly in love with her, and instead of taking her back to Prince Frouz, he arranged to marry her himself.

But the Princess was as subtle as she was beautiful, and she frightened him away by pretending that she was mad. He sent his wisest doctors to cure her, and she rushed upon them, raging like a madwoman, and they, too, fled in terror.

One day a strange physician came to the Sultan, and promised to take the madness away from the Princess.

"You see, sire," he said, "the lady has been bewitched by riding an enchanted horse. Let me place her again on the horse, and I will cure her."

The Sultan was delighted, and the strange physician was taken to the Princess. "Do you not know me, dearest?" he whispered.

It was Prince Frouz, who had been wandering in disguise all over the world in search of her.

He placed her upon the enchanted horse, and sprang beside her, and in less than an hour he brought her to Shiraz. And then they were married, with the consent of the Shah, and to the joy of all the Persian people.

THE FOX AND THE FAITHFUL HORSE

A FARMER had a horse that had been an excellent, faithful servant to him, but he was now grown too old to work; so the farmer would give him nothing more to eat, and said, "I want you no longer, so take yourself off out of my stable. I shall not take you back again until you are stronger than a lion." Then he opened the door and turned him adrift.

The poor horse was very melancholy, and wandered up and down in the wood, seeking some little shelter from the cold wind and rain. Presently a fox met him.

"What's the matter, my friend?" said he. "Why do you hang down your head and look so lonely and sad?"

"Ah," replied the horse, "my master has forgotten all that I have done for him so many years, and because I can no longer work he has turned me adrift, and says unless I become stronger than a lion he will not take me back again."

However, the fox bid him be of good cheer, and said:

"I will help you. Lie down there, stretch yourself out quite stiff, and pretend to be dead."

The horse did as he was told, and the fox went straight to the lion who lived in a cave close by, and said to him:

"A little way off lies a dead horse. Come with me, and you may make an excellent meal of his carcase."

The lion was greatly pleased, and set off immediately; and when they came to the horse the fox said:

"You will not be able to eat him comfortably here. I'll tell you what: I will tie you fast to his tail, and then you can draw him to your den, and eat him at your leisure."

This advice pleased the lion, so he lay down quietly for the fox to make him fast to the horse. But the fox managed to tie his legs together, and bound all so hard and fast that with all his strength he could not set himself free. When the work was done, the fox clapped the horse on the shoulder, and said, "Jip, Dobbin! Jip!" Then up he sprang, and dashed off, dragging the lion behind him. The beast began to roar and bellow, till all the birds of the wood flew away for fright; but the horse let him roar on, and made his way to his master's house.

"Here he is, master," said he. "I have got the better of him." And when the farmer saw his old servant his heart relented, and he said, "You shall stay in your stable and be taken care of."

MONA AND THE FORSAKEN MERMAN

MONA was the prettiest girl in the Scilly Isles. One day she was standing on a rock by the sea-shore, and the King of the Mermen saw her and fell in love with her. Catching hold of her foot, he dragged her down to his palace beneath the sea.

He was an ugly old man, and Mona did not like him, and would not wed him. His son, who was a kind and handsome young merman, also fell in love with Mona, and she fell in love with him. This made the King very angry, and he said to the Prince :

" It is time that you were married. I have chosen the fairest mermaid in my kingdom for your wife, and the wedding will take place this afternoon. Make haste and dress for it."

Then, taking Mona to the kitchen, he said : " You will have to prepare the wedding feast. If all the pies and tarts and puddings are not ready in an hour I shall cut your head off."

There were only rows of empty pots in the kitchen, and Mona could not find anything to cook.

But when the wedding party entered the church, the young Prince spoke.

" I have forgotten the ring," he said. " I must run back and get it."

On reaching the palace he rushed to the kitchen and found Mona in tears.

" Let me help you," he said. " This is how mermen prepare dinners."

He touched the pots with a magic wand and filled them with meats and puddings, so that when the wedding party came back to the palace Mona had an admirable feast ready for them. The King of the Mermen saw it and he was furious.

" Someone has been helping you," he said. " I will see into this."

At midnight the Prince and his bride retired to their room.

" Stand by their door and hold this lighted candle," said the King to Mona. " When it has burned half-way through I shall cut off your head."

When the candle was nearly burned half-way, the Prince asked his bride to hold it while Mona lighted the fire.

" Is the candle burned half-way through ? " said the old King.

" Yes," said the bride.

And with one sweep of his sword he cut off her head. The next morning the Prince asked his father if he might marry.

" You were married yesterday," said the old King.

" But you have cut my wife's head off," said his son.

When the old King understood what had happened he thought that, after all, he had better let Mona and his son marry. So they were married, and for some years they lived together very happily, and Mona had two charming little baby mermaidens. One day Mona asked if she might go up to earth once more and visit her mother and father.

" Very well," said the merman. " I will build an enchanted bridge of crystal stretching from our palace to the Scilly Isles. You must be careful not to let any man kiss you, and I will wait for you by the sea-shore at sunset, and bring you back safely beneath the waves."

Everybody in the island thought that Mona was drowned. Her father was wild with joy to see her again, and he ran up and kissed her very tenderly. As soon as her lips touched his, she forgot all about her husband and her little mermaidens and her palace under the sea.

She was not able to remember where she had been. Yet she would sit for hours by the shore and gaze sadly at the waves, and try to think of something that had happened there. Sometimes as she lay awake in her father's cottage she seemed to hear voices calling.

" What a strange noise the wind is making to-night ! " she used to say.

But one summer night, when her window was wide open, someone came beneath it and called her.

" Ah, Mona, Mona ! " he said. " You promised to return at sunset, and you keep me waiting still. Mona, have you forgotten the merman who loved you ? Your little baby mermaidens cry for you, Mona, and you do not come."

Mona listened, and everything came back to her mind. She jumped up out of bed and opened the cottage door. The merman was standing there, and she returned with him to her palace under the sea and was never seen again on the earth.

MONA AND THE MERMAN PRINCE IN THE PALACE AT THE BOTTOM OF THE SEA

Standing by the sea-shore, Mona was seized by the King of the Mermen, who carried her down to his palace at the bottom of the sea. The King's son, a kind and handsome young merman, fell in love with Mona.

ST. GEORGE AND THE DRAGON

ST. GEORGE of Merry England was the youngest and the bravest of the seven champions of Christendom. Clad in bright armour, with his magic sword Ascalon by his side, he used to travel on his war-horse in far countries in search of adventures.

One day, as he was riding across a marsh in the land of the pagans, he saw a noble and lovely maiden walking all alone towards the sea-shore.

She was dressed in beautiful robes, like a bride on her wedding-day, but her face was pale and sorrowful, and she stared in terror at the sea.

St. George rode quickly up to her. On hearing the sound of his horse's hoofs, the girl turned round, and cried:

"Flee, young knight, flee, or you will perish also!"

"God forbid that I should flee when a maiden is in peril!" said St. George.

As he spoke the sea in front of him began to rise up in great waves, and from the waves there came the sound of roaring. At the same time he heard a noise far behind him. He turned round, and saw that the walls of the city on the hills above the marsh were crowded with people, who were shrieking and wringing their hands.

"The dragon, the dragon!" cried the maiden. "Flee, or it will be upon you!"

The sound of roaring grew louder.

"Flesh and blood cannot withstand the burning flame that comes from its jaws," said the maiden. "It has destroyed two armies of soldiers; it has eaten up all our sheep and cattle, and laid waste my father's kingdom. Escape while you can, and do not try to defend me!

"Every year a young virgin comes to this marsh to be killed and eaten by the monster, in order to prevent it from rushing upon the city and slaying all the people. I am Princess Sabra, the daughter of the King, and the lot has now fallen upon me. Oh, horror, you are too late!"

While Princess Sabra was speaking, the sea began to rise up in greater waves, and from the waves there came a louder and louder sound of roaring. St. George had scarcely time to clutch his spear and lift up his shield before the dragon was upon him.

It was the most terrible monster that was ever seen on earth. It was an enormous serpent, with two great wings and four strong feet, armed with cruel claws, and in its tail there was a long, poisonous sting.

It rushed through the air upon St. George, and a burning flame came from its jaws. With a sudden stroke of its wing, it nearly felled him to the ground; but as it passed he gave it so fierce a thrust that his spear broke into a thousand pieces. Swinging back, the dragon again struck at him with its tail, and knocked him from his war-horse.

The fire of its breath made him faint and dizzy. He rose up, reeling like a dying man, but his strength returned when he drew his magic sword Ascalon.

In trying to strike him once more, the dragon exposed the tender part of its body beneath its wing, and there St. George wounded it. So deep was the wound that the dragon stood still and trembled. St. George then knelt down and prayed.

"Undo your sash and tie it about the dragon's neck. It will not harm you," he said to Princess Sabra.

The Princess did so.

"Now lead it to the market-place in the city," he said.

The dragon followed the Princess as meekly as a lamb. When they reached the city, all the people ran away, but St. George told them to have no fear; and with a blow of his magic sword Ascalon he killed the monster in the market-place.

"I did this," he said to the pagans, "to show to you the power of God, and to convert you all to the true faith."

When the pagans learned that it was a Christian knight who had subdued the dragon and made it as meek as a lamb, they gave up their false idols and became good Christians. Princess Sabra was the first to be baptised, and it was not long before she was married to her true knight, St. George of Merry England.

ST. GEORGE AND THE PRINCESS LEADING THE DRAGON TO THE MARKET-PLACE

"Tie your sash about the dragon's neck and drag it to the market-place," St. George said to the Princess, and she did so. The people fled as it came along, but the dragon was as meek as a lamb

THE IVORY MAIDEN WHO CAME TO LIFE

THE sculptors of ancient Greece were the cleverest in the world. The images which they made out of gold and ivory and exquisite marble were of wonderful beauty. The most marvellous of these statues was the ivory maiden carved by Pygmalion, the King of the island of Cyprus. It was a figure of divine loveliness, and it seemed to breathe.

When Pygmalion finished his work, he gazed at it at first in a kind of awe. Was it about to move and speak? Then, overcome by a strange and wild passion of love, he clasped the ivory maiden in his arms, and tried to kiss her into life. But all in vain. No mortal kisses had the power to change cold and hard ivory into warm and tender flesh.

Happily, however, Venus, who was the goddess of love, was very deeply moved by Pygmalion's strange and wild passion for a statue. And as he was again clasping his work and kissing it, Venus came and breathed life into it, and the ivory figure slowly changed into a living maiden in the sculptor's arms. Then, to the great joy of Pygmalion, he found that his beloved loved him as passionately as he loved her. She was named Galatea, and they were married in great splendour, and lived very happily together.

PENELOPE'S MARVELLOUS TAPESTRY

PENELOPE, a celebrated princess of Greece, was the wife of Ulysses, the brave warrior of whose prowess many tales are told.

One day Ulysses told Penelope that war had broken out in Troy, and that he must go and help to fight.

Penelope was sad to be left all alone, but determined to be brave and look forward to his return. But the wars lasted many years, and Ulysses was away so long that everybody thought he must have been killed. Penelope alone believed that he still lived.

At last foreign princes came to the land, and, seeing how beautiful Penelope was, wanted to marry her.

But Penelope refused to believe that Ulysses was dead, and would have nothing to do with the princes, who declared that they would not go away till she promised to marry one of them. This made Penelope unhappy, but as she sat at her work one day she thought of a plan to keep the princes from troubling her.

"When this piece of tapestry is finished," she said, holding out a beautiful piece of needlework, "I will choose another husband."

All day Penelope worked at the tapestry, and at night, when she was alone, she unravelled all she had done in the day. In this way the work was never finished. The princes were amazed at her industry, but as the princess would not marry until it was done they could only wait and leave her in peace. Then at last, after he had been away twenty years, Ulysses came home from the wars, to find his beautiful wife waiting for him.

ACHILLES AND THE QUEEN OF THE AMAZONS

THE Amazons were a warlike race of women who lived near the Black Sea. They never allowed any man to dwell in their country, and they even sent their own sons away, and brought up only their daughters. They were strong and hardy in body, and brave and daring in soul, and they delighted in hunting and fighting. But one day, when they were hunting, their Queen shot an arrow at a deer, and missed it, and killed her own sister.

"I will not slay myself," said the Queen. "I will die on the sword of the bravest man in the world."

Achilles was then the bravest man in the world, and he was fighting among the Greeks and against the Trojans. So the Queen of the Amazons gathered an army, and marched to help the Trojans. At first Achilles would not fight with women, but the Amazons charged the Greeks and defeated them, and he had to appear.

The Queen of the Amazons fell in love with Achilles as soon as she saw him, yet she struck him fiercely and hurt him, and he struck back and hurt her. Then, when he saw how young and lovely and valiant she was, he fell in love with her. But it was too late. He had killed her.

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THE RACE WITH THE WOLVES

CONTINUED FROM PAGE 627

ONE still night in the depth of winter a Russian baron set out from the little frontier town of Rob-rin. The snow lay knee-deep in the streets, and was still falling as the baron, with his wife and child, and his servant Eric, got into the sledge and started on the next stage of his journey home to St. Petersburg.

The landlord of the inn begged him not to attempt to travel that night, as the roads were full of snowdrifts, and packs of hungry wolves were known to be in the neighbourhood. But the baron was anxious to get on to the next town, called Bolisov, and so the order was given to start, and the four horses dashed forward into the darkness.

About an hour afterwards, as they approached a great forest through which they had to pass, the baron's wife suddenly exclaimed :

" Hark ! What was that ? "

The party listened intently, and then in the distance they heard a long, melancholy wailing that rose and fell on the still night air. There was no mistaking that sound ; it was the howling of a pack of wolves. The horses heard it, too, and in their terror galloped faster than ever. But little by little the terrible howling grew nearer.

The baron and his servant got ready their pistols, and none too soon, for, looking back, they saw grey, shadowy forms coming across the snow, and they knew that the wolves were fast overtaking them. Faster and faster flew the horses, straining at the harness and rocking the sledge from side to side. But the wolves drew steadily nearer. There were a large number of them, led by an enormous old grey wolf who, as soon as he got alongside, tried to spring upon one of the horses. Bang went Eric's pistol, and the wolf sprang into the air and fell down dead. At this the others fell back for a few moments, but they were soon again in full pursuit. This time the baron and Eric fired together, and four wolves fell dead in the snow. The rest of the pack paused for a moment hastily to devour the fallen wolves, but they, too, were soon again in full pursuit.

" There is no help for it. We must turn one of the horses loose," cried Eric. " Cut the traces."

This was done, and one of the leaders dashed aside into the forest, with the whole pack of wolves after him.

" We are saved ! " cried the baron.

But his servant Eric knew only too well that the hungry animals would soon come on again. Surely enough they did, and then another horse had to be sacrificed to gain a few moment's time.

The carriage was now within two miles of Bolisov, and the lights of the outlying houses could be seen in the distance. The party in the carriage thought they were saved ; but as they galloped along it became evident that the horses were tired out, and were slackening speed, while the wolves were once more rapidly overtaking the party. Then it was that the servant Eric proved himself a hero.

" I will get down, baron, and keep the wolves at bay while you, with your wife and child, get away to the town.

If we stay together we shall all perish. But perhaps I may have time to climb a tree, or I may manage to keep the wolves off till you return with help. If they kill me, take care of my wife and child!"

The baron could not bear the thought of losing his faithful servant in this way, but Eric was determined to risk his life to save his master. The wolves were now on both sides of the carriage, and the leading ones were snapping at the horses' legs.

"Now God be with you all!" cried Eric. "Fire as I jump out!" The baron fired, and his faithful servant sprang into the midst of the wolves. The savage animals stopped for a moment, with the blaze of the pistols in their eyes. Then came a fearful, savage yell, and Eric fired again at the wolves. Then there was silence as the horses dashed forward to the town.

Eric was never seen again, but his pistols were found lying in the blood-stained snow. A stone cross now stands on the spot bearing the name of the heroic servant on one side, and on the other the words: "Greater love hath no man than this, that a man lay down his life for his friend."

HOW THE CHILDREN SAVED THE TOWN

THE little town of Spinalunza, in Italy, was built on a long ridge of rock, surrounded on three sides by a deep ravine, so that an enemy could attack it only from the west. On the hill-top stood the cathedral, with its great square, where the children played amid orange-trees and pomegranates.

Long ago, in the autumn, a fierce captain, with 800 horses and 2,000 men, knocked at the gates of Spinalunza, demanding admission in the name of Pisa. The war bell was rung, and the people ran to defend the walls. In the morning the captain shouted from outside: "We are from Pisa; Florence is attacking us, and we must hold this town for our safety. All we ask is a pledge that you will not join Florence against us."

"What pledge do you ask?"

"Let twenty of your children ride back with us to Pisa; they shall be well cared for."

A messenger was sent out to the captain to say: "To-morrow the gates will be thrown open, and the children will come out for you to choose twenty."

The enemy spent the night in drinking; the children slept while their parents prayed. An hour after midnight the garrison met in the square, and were divided into two bands. These were ordered to descend into the ravine on the eastern side of the town, and make their separate ways until they had the enemy between them.

At daybreak the bells began to ring, the gates were thrown open, and the children trooped out, singing and holding a cross aloft. The townspeople wondered as they saw behind each child an angel with a fiery spear. As the singing children swept through the gates, panic seized upon the foe. Their horsemen fled, plunging in terror through the ranks of the footmen, and in this scene of confusion the townsmen, waiting in the woods, rushed down and put the enemy to rout.

So the children saved the town, and if you go to Spinalunza you will see groups of children playing still in the cathedral square.

THE UNDYING LOVE OF A SISTER

TWO young Romans, Simplicius and Faustinus, had for their sister a noble maiden named Beatrice. They lived in Rome at a time when persecution of the Christians had ceased, and they all three worshipped the living Christ in peace.

But a new emperor came to the throne, and the old martyrdoms began again. The two brothers were called upon to deny Christ. They refused. Then they were tortured, beheaded, and their bodies were thrown into the river.

Beatrice haunted the riverside to rescue their dear bodies from dishonour. And she found them, and carried them in secret to a cemetery and gave them Christian burial. Then it came to her turn to suffer, and, refusing to worship idols, she was strangled.

A faithful old woman who had helped this brave girl to rescue the bodies of her brothers rescued the body of Beatrice, and laid it in the same grave with her brothers.

The next Golden Deeds are on page 1053

WHAT OUR LESSONS TEACH US

HERE are some more pictures to help us to read words of four letters. In the writing lesson we learn five new letters, and our arithmetic lesson explains how to write numbers from 10 to 99. The drawing lesson tells us how we can draw a jam-jar, and the music lesson tells the story of the procession in Treble Road; while our picture story in French shows us the party safely on board the boat.

CONTINUED FROM PAGE 736

WORD-BUILDING

LITTLE WORDS OF FOUR LETTERS

Perhaps by this time you feel that you can spell a good many words of two and three letters. If so, you will be wanting to get on to longer words—words with four letters in them. Although these look rather hard and long, they are not really so very bad, and you will soon read them if you try.

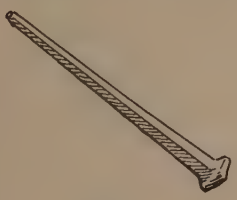
I am sure that you can now tell me that I L L spells ILL. So, if you remember that, you will easily spell the next three words underneath the pictures.

BILL

HILL

MILL

Then again, A I L spells AIL, and out of this you can make many words of four letters each. such as FAIL. HAIL, PAIL, and those given with pictures below.



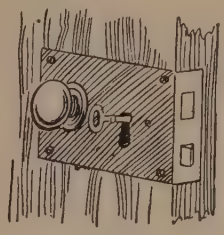
NAIL

SAIL

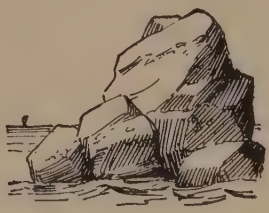
TAIL

You will be able to make many other words from four letters. Perhaps you can make the next words out by yourselves.

COCK

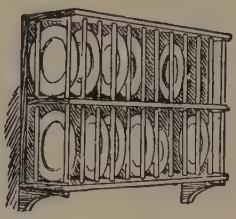


LOCK

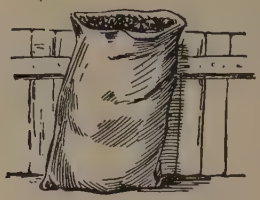


ROCK

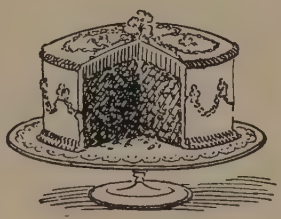
BACK



RACK

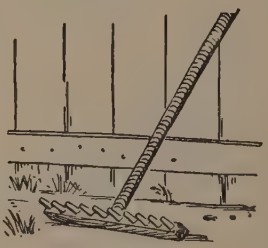


SACK



CAKE

LAKE



RAKE

Now, will it help you if I ask you some questions, and give you the answer in a picture? Here are the questions, and you will all know the answers, I am sure.

What did the cow jump over?

MOON

PLUM

What did Little Jack Horner pull out of his Christmas pie?

What did Old Mother Hubbard look for in the cupboard?

BONE

HORN

What was Little Boy Blue asked to blow?

BOWL

What did the Wise Men of Gotham go to sea in?

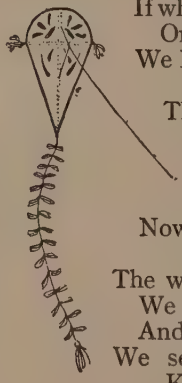
SHOE

Where did the old woman live who had so many children that she did not know what to do?

If you would like some little rhymes, here are a few. I am very fond of them myself, and I hope you like them, too.

Has Santa Claus come yet, I wonder?
I must run to my stocking and look.
On top is a ball, and just under
There is something that feels like a BOOK.

Perhaps further down is a dolly,
And some chocolates also, I hope;
Oh, mother, this really is jolly,
And here is a new skipping ROPE!



If when we walk along a lake
Or near a marsh or bog,
We hear a noise, we can't mistake
The croaking of a FROG.

Now for some fun, here comes the sun,
The wind is exactly right:
We let out the string,
And with good hearty fling
We send up our beautiful KITE.

PRIMARY READING LESSON

Humpty Dumpty sat on
a wall,
Humpty Dumpty had a
great fall;
All the king's horses and
all the king's men
Couldn't put Humpty
Dumpty together again.

Here is Humpty Dumpty.
See him on the wall.
You are up high, Humpty Dumpty.
Do not fall.

Oh, Humpty Dumpty,
What a fall!
The king's horses are coming,
The king's men are coming!
Poor Humpty Dumpty.

Oh, Humpty Dumpty,
May I sit by you?
Is it too high for me?
I'll jump and jump and jump!
Is it too high?

The king's horses came.
The king's men came.
They saw poor Humpty Dumpty.
They tried to put him back again.
They tried and tried and tried,
But they could not!

ACTION SENTENCES

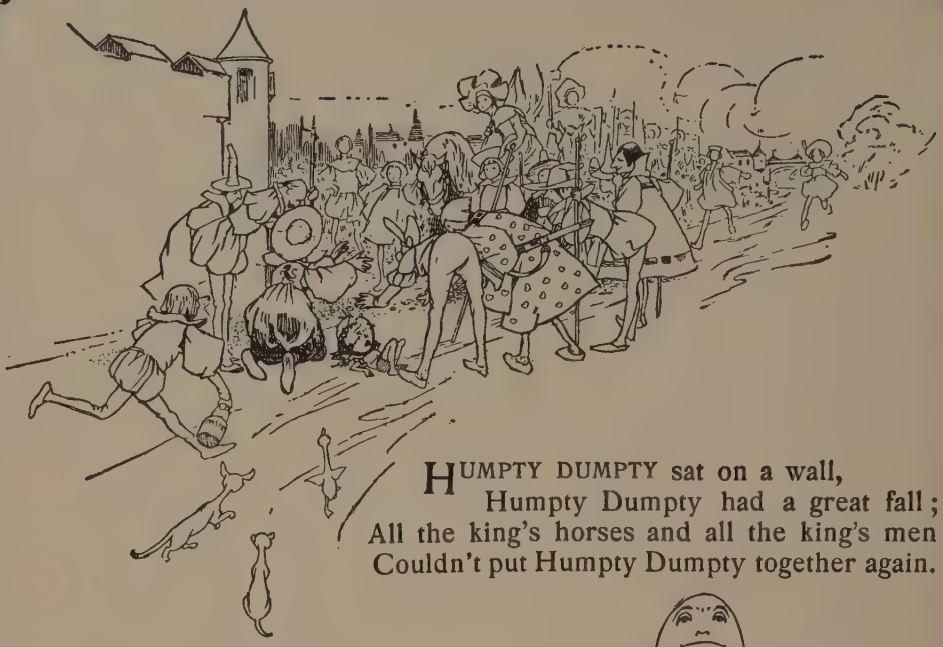
Play you are Humpty Dumpty.

Sit on the wall.

Play you had a fall.
The king's horses and men come to pick you up—

What will you do?

Copyright, 1910, by M. Perry Mills.



HUMPTY DUMPTY sat on a wall,
Humpty Dumpty had a great fall;
All the king's horses and all the king's men
Couldn't put Humpty Dumpty together again.

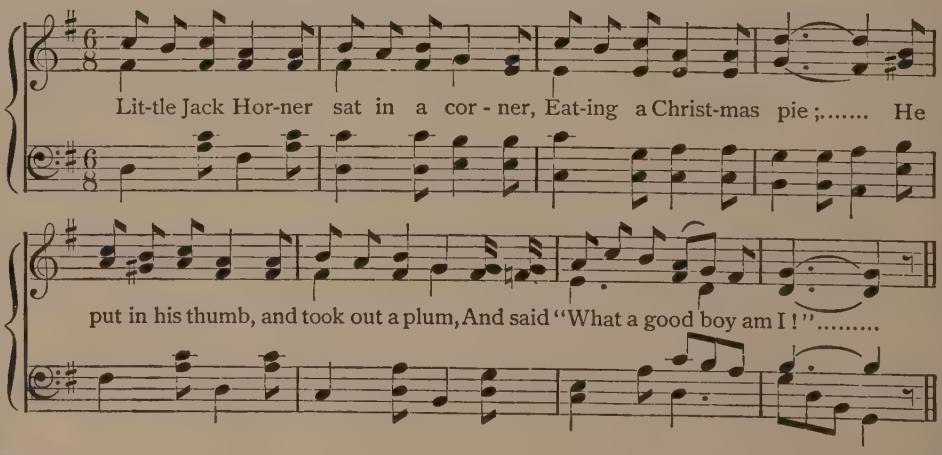
WHEN I was a little boy,
I had but little wit;
It is some time ago,
And I've no more yet.

Nor ever, ever shall,
Until that I die;
For the longer I live,
The more fool am I.

PETER WHITE will ne'er go right,
Would you know the reason why?
He follows his nose wherever he goes,
And that stands all awry.

LADY-BIRD, lady-bird, fly away home,
Your house is on fire, your children at home,
All but one that lies under a stone;
Fly thee home, lady-bird, ere it be gone.

LITTLE JACK HORNER



FIVE NEW LETTERS

After practising o, c, a, and e until they wrote them quite well, Tom and Nora were ready to write r. As their mother was ruling the lines as usual, Tom exclaimed :

"Mother, do let me rule my lines."

"Of course you shall, Tom. You have often seen me do it."

Tom took the flat ruler, and placed one end of it even with the side of the paper, then pressed the left hand down on the middle of the ruler to steady it, and drew his pencil along the upper edge.

"Very good," said his mother.

Nora ruled lines for herself, too, and their mother was pleased that they could do them so well.

"The first letter to write to-day is r," she said, as she set them some to copy. "How am I making r?"

"It begins like n," said Nora, "but ends in a little tail at the top instead of in a second pot-hook and pot-hanger."

"There is one thing to be careful about," their mother said. "In the second part let your pencil move upwards along the down-stroke again, until it nearly reaches the upper line. You will see why presently. There is another way of making r, and you shall learn about it some day."

When even rows of r's had been written by Tom and Nora, and they had ruled more lines, their mother said they should next write v; so she made some v's for them to copy, and asked how v is like r, and how it differs from it.

Nora looked at the r's carefully and then said :

"I think the first part of v is like the first part of r; but the up-stroke does not go up again over it, but turns round and becomes a pot-hanger, and then ends in a little curly tail like r."

"Quite right," said her mother, "and you can see now why r has its up-stroke carefully made. If the up-stroke separates from the rest, the letter might be taken for a v."

"V is a pretty letter," said Tom, "and so easy—a pot-hook, a pot-hanger, and a curly tail."

Nora liked making it, too, and when she had written some really good ones her mother said :

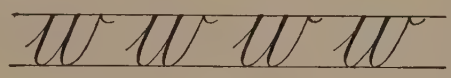
"We all like writing v because it has such pretty curves in it, and is no trouble at all. The next letter will take longer to write."

"What is that?" asked Tom.

"W," was the reply.

"I wonder," said Nora, "whether w is really two u's, like this—uu. Is it, mother?"

But their mother shook her head, and, saying it was much more like one u than two u's, she made them some to copy, like this :



Tom and Nora exclaimed that it was just like u with a little curly tail like that of v. Then they set about writing it, and did it so quickly and nicely that their mother said :

"Capital! Now I am sure you will always know the difference between r, v, and w."

"R, v, and w, three little letters with little curly tails," said Nora.

Then their mother said they had done so well that there was time for two more letters—x and s. So the children ruled more lines and their mother wrote x for them to copy, like this :

"Why, mother, look!" exclaimed Tom. "One c has turned another upside down, and is pushing it backwards!"

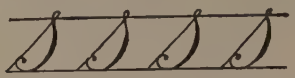
They all laughed at Tom's idea, and Nora said the c upside down did not look very much hurt.

Of course, the second part of x was nothing new to learn, only the first part. The upside-down c had to be carefully made, because it was something quite new to make the down-stroke of a pot-hook turn round to the left. But Tom and Nora tried very hard until they made the c's lean up against each other in quite a friendly way.

When Tom and Nora had made some really good x's, their mother said they should learn another letter.

"What are we going to write now?" asked Tom.

"You are going to learn s," said their mother. "S has a long, light up-stroke, and then curves down and round to the left, as the first part of x does; but be very careful to make the dot curl round right on the light up-stroke, just as I make it here."



S looked easy, but it wanted a good deal of practice, just as o had done, and Tom especially had to try again and again before he could make a nice row, with each letter like the one before it.

In our next lesson we shall see how Tom and Nora learned to make letters that go outside the lines.

ARITHMETIC

HOW WE COUNT FROM 10 TO 99

At the end of the last lesson we said we were going to count a big number of cards, or pencils—a number bigger than twelve. To learn how to do this, let us count *ten* of the pencils in the picture, and tie them into a bundle. When we have done this we will count another ten and make another bundle. After that, you see there are only two pencils left. Here are the pencils:

They made two bundles, and left two pencils over.

Now, we must not get the odd pencils mixed up with the bundles, so let us have two boxes. In one box we will put the bundles, and in the other we will put the pencils which were left over. But we will always be careful of one other thing—always to put the box for the bundles *on the left-hand side*, and the box for the separate pencils *on the right-hand side*. Then, too, we put a figure on each box to tell us how many bundles are in the left-hand box, and how many loose pencils in the right-hand box.

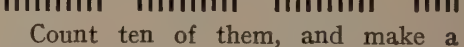
Box for the bundles

Box for the loose pencils

We will try to remember, then, that when we counted the pencils in the first picture, tying them up into bundles of ten, we found two bundles and two loose pencils, so that the figures on the boxes were [2] [2].

Take the pencils out of the boxes, rub out the figures, and let us try another number.

For our next attempt we need not have a picture of the pencils; straight strokes will do instead.



Count ten of them, and make a bundle. Count ten more, and make a second bundle. Ten more yet will make a third bundle; and then we have one — two — three — four — five loose strokes left. So we have three bundles to put into the left-hand box, and five loose strokes to put into the right-hand box. The numbers on the boxes will look like this: [3] [5].

Suppose, now, somebody else had been counting pencils in the way we have just been doing, and that they had made a figure 9 on the left-hand box and a figure 7 on the right-hand box [9] [7]. How many pencils would that mean? It would mean there were 9 bundles with ten in each bundle, and 7 loose pencils besides. Or, again, if they had put a figure 4 on the left-hand box and a figure 0 on the right-hand? [4] [0] It would mean 4 bundles in the left-hand box and no pencils at all in the right-hand.

Now that we have got so far, perhaps we can manage without the boxes at all, and simply remember that we write the figure for the bundles on the *left-hand side* and the figure for the loose pencils on the *right-hand side.*

The first **set** of pencils we counted will have the figures written like this : 22. The second **set** will be 35.

And they mean just the same as they did when the boxes were there. When we write 22, the 2 on the left means 2 bundles of ten, and the 2 on the right means 2 loose pencils. When we write 35, the 3 means 3 bundles of ten (because it is the *left-hand* figure), and the 5 means 5 loose pencils.

Perhaps you are thinking by this time that we still have not learned the *names* of any numbers bigger than twelve. Never mind; we are getting near it now. Suppose you have six of the cards which you use for playing "Snap," and you then get six more given you. How many have you altogether?

Six you have at first.

Six you have given you.

Of course, you know that at once. Twelve cards. It is the same thing as counting the crows and owls; six crows and six owls made twelve birds altogether. Now we will count the cards in the same way that we counted the pencils.

These make a bundle of ten, and leave two loose cards.

You see, we can make one bundle of ten cards, and we have two loose cards left. The figures to put on the boxes would be [1] [2], or, since we said we could do without the boxes at all, we have only to write 12.

Now we understand why we said in Lesson 3 that we should find 12 stood for *twelve*. It is because the 1, the *left-hand figure*, means one bundle of ten things, and the 2, the *right-hand figure*, means two more things.

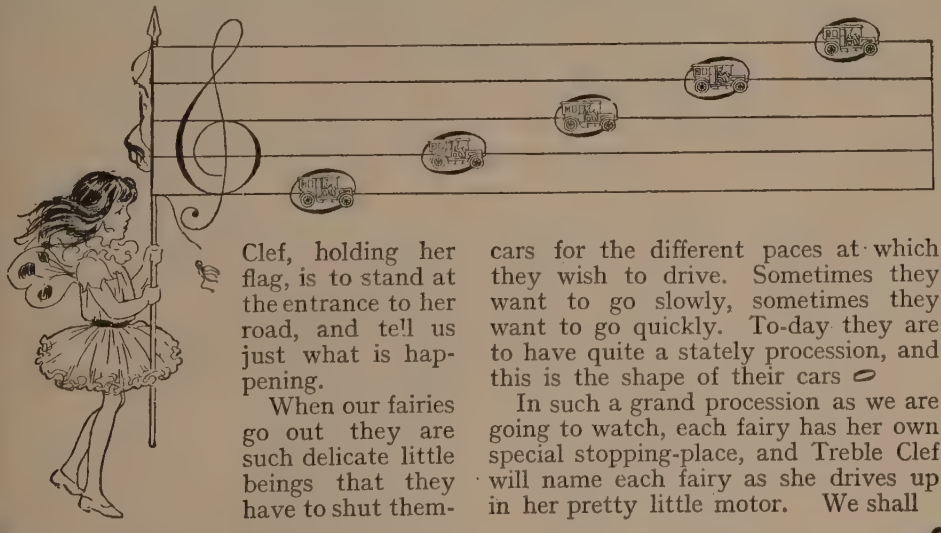
In the same way, if you have eleven cards, you get *one* bundle of ten and *one* card left, so that the figures to put on the boxes are 1 and 1, and thus 11 stands for eleven.

If you have only ten cards, there are no cards left to put into the right-hand box; which tells us that the figures which stand for ten are 10.

Next time we shall learn the *names* of the figures after twelve.

THE PROCESSION IN TREBLE ROAD

OUR little fairy guide, Treble Clef, has a very busy day before her. The fairies are going to have a procession. They are coming in their little motor-cars down the Treble Road, and Treble Clef, holding her flag, is to stand at the entrance to her road, and tell us just what is happening.

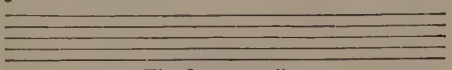


When our fairies go out they are such delicate little beings that they have to shut themselves safely in their wee motors, so that the sun shall not scorch them or the wind blow them away. And so we see the cars, but not our fairies.

The fairies have different sorts of cars for the different paces at which they wish to drive. Sometimes they want to go slowly, sometimes they want to go quickly. To-day they are to have quite a stately procession, and this is the shape of their cars

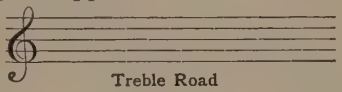
In such a grand procession as we are going to watch, each fairy has her own special stopping-place, and Treble Clef will name each fairy as she drives up in her pretty little motor. We shall

see where each one stops. We found there were five motor-lines, did we not? Just like this:



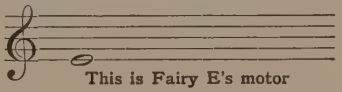
The five motor-lines

which the fairies call a staff, and these are the lines our fairies are using to-day. There is a little movement, quite a gentle stir, for fairies tread daintily, and Treble Clef is in her place, looking very important, and beckoning to you and to me to watch very carefully so that we may see everything that is going to happen.



Treble Road

Hark! A gentle, buzzing noise, like the whirr of insects' wings, tells us the first fairy car has arrived.



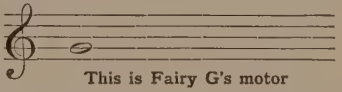
This is Fairy E's motor

Treble Clef cannot talk loudly to us now, because she is on duty; but, in a whisper which we hear quite clearly, she says:

"This is Fairy E's car. She is inside, and now she has stopped on the first motor-line. We must go to the piano, and find that house of hers which is very near the middle of the black and white line. It is the second white door from Fairy C's middle house. Press the door very gently, and you will hear Fairy E sing:

Fairy E's motor on first line does stay,
So this is where you find her to-day.

Another little flutter, and a second motor-car arrives and stops on the second line:

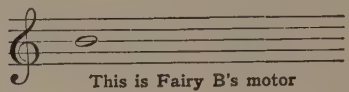


This is Fairy G's motor

"Behold Fairy G's car!" whispers Treble Clef. Go to the piano, and find her house, next door but one to where we have just found fairy E. Press the door very gently, and listen to Fairy G's voice:

The sun is bright, the weather fine,
G's motor stops on the second line.

Still another rustle, like a murmuring breeze, and Fairy B's car arrives. She goes on till she reaches the third line:



This is Fairy B's motor

Treble Clef tells us to go to the piano and find Fairy B's house, next door but one to Fairy G. Press this door, and hear Fairy B answer:

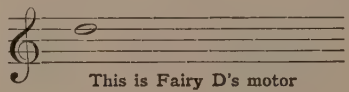
'Tis quite the right door, how clever you are!
On line number three stops Fairy B's car.

Tinkle, tinkle, tinkle! Another fairy has arrived.

"Fairy D is coming to take her place on the fourth line," says Treble Clef in her gentle whisper.

Off we run to the piano and find Fairy D's house, the next door but one to where we heard Fairy B speak. Directly we press the door, Fairy D sings:

When Fairy D's coach stops at line number four,
You may rest content that this is her door.

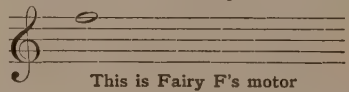


This is Fairy D's motor

Again there is a rustle, gentle as a butterfly's kiss, and Treble Clef's voice again is heard. "Here comes Fairy F's motor, to take her place on the fifth line."

Once more we must go to the piano, find Fairy F's house, the next door but one to where we have just found Fairy D, and, pressing the door very gently, we hear Fairy F's sweet song:

In the wide, wide world I never need roam,
For line number five is Fairy F's home.



This is Fairy F's motor

Then the birds sing, the bluebells ring, the trees shimmer in the breeze, all for pure gladness of heart, for, now a fairy car has stopped on each line of the Treble Road, birds, flowers, and trees know the fairies will sing a merry rhyme for boys and girls to remember:

Five little fairies bright as the day,
What do we want but a game of play?
Five little fairies in motor-cars,
Five little motors, five little bars.
E on the first line, G number two,
B on the third line, going so true.
D on the fourth line, F number five,
Dear little fairies, bright and alive.

Next time we shall hear about the meeting on Bass Road.

HOW TO DRAW A JAM-JAR

TO-DAY we are going to draw a jam-jar, but before we begin we shall want a penny. When you have it, put it on the back of your hand, laying the hand flat on the table. The penny looks quite round, does it not? Raise your hand slowly till it is level with your eyes, and notice that the penny seems to get narrower and narrower, till at last you can see only the edge, and neither the one side nor the other.

If your hand were made of glass, and you raised it still higher, you would see the underneath side of the penny through it, and it would look wider and wider, till at last, when it was right above your eye, it would look quite round again. And so we see how things seem to alter in shape as we move them about. Quite big things look tiny if we see them at a distance. Now we must get our drawing things. We want two sheets of brown paper, one sheet of white paper, a pair of scissors, some white and some black chalk, and a clean, white jam-jar. Pin a sheet of brown paper on your board, put the white jar on the white paper, and draw round it with a piece of black chalk very carefully, so as to make a circle on the paper. Cut this circle out with the scissors, draw a straight black line across the middle of it, and put it on the other sheet of brown paper in front of you, and move the sheet gradually further and further away. You will see that it looks narrower and narrower. By putting the black line across you get two semicircles; the one furthest away looks narrower than the other. Keep the white circle still on the paper, and hold the paper at each side, and raise it gradually to the level of your eye. You will see that it seems to get narrower, as the penny did, till it looks only like a white line. Get someone to hold the sheet of paper and raise it for you if you can. It is better held a little way off. Practise drawing the ovals by themselves, using the side of the white chalk and rubbing it on the brown paper. Make the best circle you can, and then do different widths of ovals.

These three pictures show how the circle and ovals should be drawn in chalk.

This drawing shows the jam-jar a little below the level of the eye, so that you can see inside it.

In this picture we cannot see inside the jar because the top of the jar is a little above the level of the eye.

When you have practised these a little, pin the other sheet of brown paper on the board, and put the jar a little way off in front of you on the table. You can see inside it because it is *below* the eye. Can you see a dark shadow and a white light? Put the shadow in with black chalk, then use white chalk thinly, and then white chalk thickly, as you see in the picture, till you have made the oval the proper shape; it should be more curved in front than at the back. Now make the lightest side with white chalk, the darkest side with black chalk, and join them by using white chalk thinly.

Notice the curve at the bottom. Is it rounder than the top curve or less round? More round, of course; the curves get *less* round the nearer they are to the level of the eye. You never see the top of the jar quite round unless it is underneath your eye. A wasp sees it quite round when he is flying downwards into it to look for jam; but when he is crawling towards it on the table he cannot see inside it at all, because it is above his eye. It looks like the drawing on this page. If it were a glass jar he could see the curve of the top through the sides. Get a glass jar or a tumbler and hold it above the level of the eye, and you will see what is meant.

LITTLE PICTURE-STORIES IN FRENCH

OUR story this time, which is continued from page 736, tells us how the party make their way to the boat. Remember that the first line under each picture is the French, the second gives the English word for the French word above it, and the third line shows how we make up the words into our own language.

Il est presque une heure.
It is nearly one hour.
It is nearly one o'clock.

Le bateau va bientôt partir.
The boat goes soon to start.
The boat will soon start.

Il y a beaucoup de voyageurs.
There are many of travellers.
There are many travellers.

Tout le monde se dépêche.
All the world itself hurries.
Everyone is hurrying.

Nous courons vers le bateau.
We run towards the boat.
We run towards the boat.

On crie : " Monsieur Hawes ! "
One cries : " Mr. Hawes ! "
Someone calls : " Mr. Hawes ! "

C'est un télégramme pour papa.
It is a telegram for papa.
It is a telegram for papa.

Papa l'ouvre ; c'est de notre oncle.
Papa it opens ; it is from our uncle.
Papa opens it ; it is from our uncle.

Il nous souhaite bon voyage.
He us wishes good journey.
He wishes us a good journey.

Nous sommes enfin sur le bateau.
We are at last on the boat.
At last we are on the boat.

C'est un grand bateau à vapeur.
It is a large steamer.
It is a large steamer.

Le pont est rempli de bagages.
The deck is covered with luggage.
The deck is covered with luggage.

Papa s'occupe des nôtres.
Papa himself busies of ours.
Papa looks after ours.

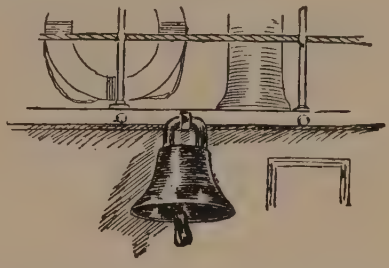
Une vieille dame nous fait rire.
An old lady us makes to laugh.
An old lady makes us laugh.

Elle a perdu son perroquet.
She has lost her parrot.
She has lost her parrot.

La bonne aperçoit la cage.
The nurse sees the cage.
Nurse sees the cage.

La dame est enchantée.
The lady is delighted.
The lady is delighted.

C'est un bruit épouvantable!
It is a noise frightful!
There is a frightful noise!



La cloche sonne. Nous allons partir.
The bell rings. We go to start.
The bell rings. We are going to start.

Nous nous asseyons sur le pont.
We ourselves sit on the deck.
We sit on the deck.

The next School Lessons are on 1205